

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.



23
O. E. S.-Doc. 5.

3772
75
U. S. DEPARTMENT OF AGRICULTURE.

OFFICE OF EXPERIMENT STATIONS.

EXPERIMENT STATION BULLETIN No. 1.

75
ORGANIZATION

OF THE

AGRICULTURAL EXPERIMENT STATIONS

IN THE

UNITED STATES.

FEBRUARY, 1889.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1889.

U. S. DEPARTMENT OF AGRICULTURE.

OFFICE OF EXPERIMENT STATIONS.

W. O. ATWATER, DIRECTOR.

EXPERIMENT STATION BULLETIN No. 1.

ORGANIZATION

OF THE

AGRICULTURAL EXPERIMENT STATIONS

IN THE

UNITED STATES.

FEBRUARY, 1889.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1889.

THE
THE
THE

TABLE OF CONTENTS.

	Page.
Introduction, by the Secretary of Agriculture	5
Letter of transmittal	11
Organization and first work of the Office of Experiment Stations	13
Chronological statement of the organization of the experiment stations in the United States	20
Statement of the number of station workers and revenues of the experiment stations in the United States	22
List of agricultural schools and colleges in the United States; locations; pres- idents	24
List of experiment stations in the United States; members of governing boards and station staffs; post-office addresses	28
United States legislation regarding experiment stations	58
Treasury rulings on the act of Congress of March 2, 1887	69
Post-Office rulings regarding the free transmission of experiment station re- ports and bulletins	72
A brief account of the experiment station movement in the United States	73



INTRODUCTION.

BY THE SECRETARY OF AGRICULTURE.

Ever since men began to reason, the problems of animal and vegetable production have occupied their profoundest thought. Harmoniously with the development of modern research has grown the investigation of the air, the soil, the plant, and the animal in their agricultural relations. The private investigator, the university, and finally the agricultural experiment station have tried by searching to find out the knowledge that will help the farmer in the culture of his soil and of his mind as well. Such success has crowned their efforts that a great host of practical toilers throughout the land have become eager to learn the results, discriminate in estimating their value, able to apply them in practice, and earnest in the demand for the liberal support of wise enterprises for the application of science to agriculture.

Nearly forty years ago a company of farmers joined themselves together in the little German village of Moeckern, near the city, and under the influence of the University of Leipsic, called a chemist to their aid, and with later help from Government, organized the first agricultural experiment station. Liebig in Germany, Boussingault in France, Lawes and Gilbert in England, and other great pioneers had been blazing the path of progress for years before; but the action of these Saxon agriculturists, in 1851, marks the beginning of the experiment station proper—the organization of scientific research with the aid of Government, “as a necessary and permanent branch of agricultural business.”

The seed thus sown has brought forth many fold. In 1856 there were five; in 1861, fifteen; in 1866, thirty; and to-day there are not far from one hundred experiment stations and kindred institutions in the different countries of Europe. In each of these, from one to ten or more investigators are engaged in the discovery of the laws that underlie the practice of farming, and in finding how they are best applied. Managed in the interest and largely under the control of farmers—but most of them connected with educational institutions, where experience shows their work is most successfully done—these stations seek answers to the questions which agricultural practice is asking as to the tillage

of the soil ; the nature and action of manures ; the culture of crops ; the food and nutrition of domestic animals and of man ; the production of milk, butter, and cheese ; the diseases of plants and animals, and, in general, whatever the agriculturist needs to know, and experimental science can discover.

Private persons, societies, schools, universities, and governments have learned the usefulness and indeed the necessity of these institutions, not for the farmer alone, but for all who are dependent upon the products of the soil. The movement is extending to Asia and to South America ; everywhere, indeed, its importance is coming to be felt.

The first agricultural experiment station in America was established in Connecticut in 1875. The example was speedily followed elsewhere, so that in 1880 there were four, and in 1886 some seventeen of these institutions in fourteen States. The appropriation by Congress of \$15,000 per annum to each of the States and Territories which have established agricultural colleges, or agricultural departments of colleges, has led to the establishment of new stations or the increased development of stations previously established under State authority, so that there are to-day forty-six stations in the United States. Several of these have sub-stations working under their management. Every State has at least one station, several have two, one has three, and Dakota has set the Territories an example by establishing one within her boundaries.

These forty-six stations now employ over three hundred and seventy trained men in the prosecution of experimental inquiry. The appropriation by the United States Government, for the current year, for them and for the Office of Experiment Stations in this Department is \$595,000. The several States appropriate about \$125,000 in addition, making the sum total of about \$720,000 given from public funds, the present year, for the support of agricultural experiment stations in the United States.

Of all the scientific enterprises which the Government has undertaken scarcely any other has impressed its value upon the people and their representatives in the State and national legislatures so speedily and so strongly as this. The rapid growth of an enterprise for elevating agriculture by the aid of science, its espousal by the United States Government, its development to its present dimensions in the short period of fourteen years, and, finally, the favor with which it is received by the public at large, are a striking illustration of the appreciation on the part of the American people of the wisdom and the usefulness of calling the highest science to the aid of the arts and industries of life.

It is proper that our Government should undertake this enterprise on a grand scale, that taking advantage of all that has been done in this direction in other countries it should make an earnest effort to give to the people in every quarter of our great republic the benefits that must inevitably come from wisely directed investigation in the science and art of agriculture. Historians and scientists tell us that in ancient

times the depletion of the soil and the decline of agriculture were followed by impairment of the vigor of nations and contributed to their downfall. "In modern Europe science and practice have allied themselves in the elevation of agriculture, fertility has been restored to the land and the national welfare provided for. We are repairing the same evil in the older States of our East and South, taking steps to prevent it in our younger States and Territories of the Mississippi Valley and Pacific Slope, and even developing into wonderful productivity millions of acres of what was once known as The Great American Desert. To this still youthful nation is reserved the opportunity not only to forestall the exhaustion of its soil, but also to make a 'wilderness blossom as the rose.' It is for these things that we are calling to our aid the teachings of the best science and experience of the world."

The present is an auspicious time for this undertaking. "In the history of no nation before have there been such a thirst for knowledge on the part of the great masses of the people, such high and just appreciation of its value, and such wide-reaching, successful, and popular schemes for self-education; no other nation has so large a body of farmers of high intelligence, never before has the great agricultural public been so willing and indeed so anxious to receive with respect and use with intelligence the information which science offers; never before has science had so much to give." The prospects, then, for this, the largest scientific enterprise in behalf of agriculture that any government has undertaken, are full of promise.

The number and diversity of problems to be solved in the widely separated sections of our country, the need of linking the stations together, of helping to co-ordinate their efforts, of bringing to them the fruits of accumulated experience, of assisting them in research, and of collating their products and making them available to the public whom they serve, and the evident propriety that the Department of Agriculture should aid the enterprise in these respects--all these considerations evince the wisdom of Congress in providing for a central bureau, as a branch of this Department, to meet the need.

The following passages are taken, with slight changes, from the report for 1888 of the Commissioner of Agriculture to the President.

In order to carry into effect the provisions of the act of March 2, 1887, by which the experiment stations are established, and of acts supplementary thereto, the act approved July 18, 1888, entitled "An act making an appropriation for the Department of Agriculture for the fiscal year ending June 30, 1889, and for other purposes," appropriates:

Five hundred and ninety-five thousand dollars; ten thousand dollars of which sum shall be payable upon the order of the Commissioner of Agriculture to enable him to carry out the provisions of section three of said act of March second, eighteen hundred and eighty-seven, and to compare, edit, and publish such of the results of the experiments made under section two of said act by said experiment stations as he may deem necessary; and for these purposes the Commissioner of Agriculture is authorized to employ such assistants, clerks, and other persons as he may deem necessary.

Section 3 of the act of March 2, 1887, provides:

That in order to secure, as far as practicable, uniformity of methods and results in the work of said stations, it shall be the duty of the United States Commissioner of Agriculture to furnish forms, as far as practicable, for the tabulation of results of investigation or experiments; to indicate, from time to time, such lines of inquiry as to him shall seem most important; and, in general, to furnish such advice and assistance as will best promote the purposes of this act. It shall be the duty of each said station, annually, on or before the first day of February, to make to the governor of the State or Territory in which it is located a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States.

While, in accordance with its duty in the disposition of public funds, the Government reserves the right to regulate the research which it endows, and while this regulating power is implied in the legislation by which the stations themselves are established, it should, in my opinion, be exercised mainly in the form of wise and sympathetic help.

The Department of Agriculture can aid the experiment stations in their relations to each other, in their use of the results of experimental research, and in their connection with the agricultural public. To be first among the stations, the Department should be the servant of them all. It should exercise not dictatorship but leadership. Its influence should be powerful in bringing the stations together and in co-ordinating their work; in making the fruits of other research and experience, past and present, at home and abroad, available to them; in prosecuting lines of pioneer research which will in a measure relieve the stations of a difficult but necessary task, and enable them to apply their energies more fully and successfully to the study of the questions which bear directly upon the practice of agriculture, and will, at the same time, prepare the way for the abstract inquiry which earnest station workers aspire to but which the public have not sufficiently learned to appreciate; in collating, condensing, and distributing their results, and in helping to carry the practical outcome to the farmer in a form in which he will appreciate and use it.

To carry out this work I have instituted an Office of Experiment Stations as a special branch of this Department and appointed a director at its head. The organization and functions of this office will naturally shape themselves to the needs of the enterprise as they arise.

The well-advised deliberations and action of the Association of American Agricultural Colleges and Experiment Stations were referred to in my last report to the President. It will be observed that the recommendations there made are entirely in accordance with those of the committee on station work of that organization, the report of which was published by this Department last winter, and that the work which the Department has undertaken in connection with the experiment stations has been placed in charge of the chairman of that committee.

who was also the first director of the first American experiment station.

The path of success in this experiment-station enterprise passes by the fountains of abstract science and by the farms and firesides of the American people. The committee just referred to were right in saying in their report that "the American farmer, although not a scientific specialist, has a keen sense of what is sound and good," and that the stations "will be sustained in proportion as they help the cause they are intended to serve. It is essential that they recognize the immediate demand for things immediately useful; that they find what questions are of direct, practical importance, and give such questions an amount of early attention which under other circumstances might be disproportionate. But it is vitally important that the highest scientific ideal be maintained and every effort be made toward its realization. The future usefulness of the stations will depend upon what they discover of permanent value, and this must come largely from the most abstract and profound research; to forget this will be fatal."

"The stations must also remember that it is their office not only to experiment, but to teach; that it is their duty to gather information as well from accumulated stores as from the fields in which they are working, and to bring it not 'down to the farmer,' but home to him. By thus using their most honest and earnest effort to help the farmer they will secure from him and from the public at large the support they need for their highest work."

If the Department is to do its share of this great work, it must be by unifying the efforts of the stations, bringing the best science of the world to their aid, and by collating their products and distributing the practical results among the people at large. For this it needs the hearty sympathy of the stations and the generous support of Congress. I trust that in due time means will be provided to enable the Department to secure, retain, and develop to their highest efficiency the ablest men in the different lines of work, and to insure all needed means for meeting the demand imposed upon it by so great an undertaking. If this call is for something greater than has ever elsewhere been done, it is because of the magnitude of the experiment station enterprise, the urgency of the demand, and the wisdom of generous supply.

At a convention of representatives of agricultural colleges and experiment stations, which met at this Department by invitation of myself, as Commissioner of Agriculture, in July, 1885, the organized effort was begun, which, nearly two years later, resulted in the passage of the act of Congress for the establishment of the stations. In this centennial year of the existence of the Federal Government, on the day of my taking the oath of office, and immediately after that ceremony by which the elevation of this branch of the Government service to an Executive Department is consummated, it gives me great satisfaction

that the public document to which I affix my name for the first time as Secretary of Agriculture is the initial publication of the office representing the connection of this Department with an enterprise which I believe to be fraught with so great and lasting benefit to my fellow-countrymen of the Republic.

NORMAN J. COLMAN,
Secretary of Agriculture.

WASHINGTON, D. C., *February 15, 1889.*

LETTER OF TRANSMITTAL.

DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,

February 15, 1889.

SIR: I have the honor to transmit herewith, for publication, Experiment Station Bulletin No. 1, containing an account of the organization and first work of this office, statistical tables relating to the establishment, officers and revenues of the experiment stations of the United States, lists of the governing boards and station staffs, the United States legislation regarding experiment stations, the rulings of the Treasury and Post-Office Departments on the legislation, and a brief history of the experiment station movement in the United States.

It must surely be regarded an auspicious circumstance, that the first publication issued under the authority of the Secretary of Agriculture is one relating to an enterprise in which science joins hands with the art of agriculture in an effort to secure the greater welfare of mankind.

Very respectfully,

W. O. ATWATER,
Director.

Hon. NORMAN J. COLMAN,
Secretary of Agriculture.

ORGANIZATION AND FIRST WORK OF THE OFFICE OF EXPERIMENT STATIONS.

The following, from the Report of the Commissioner of Agriculture for 1888, will, with the statements above by the Secretary of Agriculture, explain the ideas held in view in the initiatory work of this office :

The organization and functions of this office will naturally shape themselves to the needs of the enterprise as they arise.

The most immediately pressing need seems to be that of a clearing-house and an exchange for the stations. The stations are widely separated ; they need to know more about each other's work ; they need each other's help, especially that which comes from the interchange of experience. Much is gained by the proper distribution of work and by co-operation where that is feasible. As a clearing-house this office can facilitate intercommunication between the stations, collate the results of their work, and facilitate its most advantageous co-ordination. It can serve as an exchange or distributing point for information in two ways, negotiating between the stations and the agricultural public on the one side and between the stations and the world of science on the other.

One of the means by which this Department can mediate between the stations and the agricultural public is the issuing of a series of farmers' bulletins, which should collate the results of station work bearing upon special topics, and the teachings of other research, and put the whole into a form so plain that the intelligent farmer will understand it, so brief that he will read it through, and so practical that he will take it to heart. Thus while each station is distributing its own results to the farmer of its own State, this instrumentality will help to make the several stations serviceable to the agriculture of the whole country.

As a mediator between the stations and the world of science, this branch of the Department should be in a condition to collate the results of experimental research in this country and in Europe, and publish them in convenient form for the use of the station workers and others interested in the science of agriculture. The past forty years has been a period of great and increasing activity in agricultural inquiry, especially in Europe. The mass of material accumulated is large and rapidly growing ; it is mostly in foreign languages, and in costly journals, publications of learned societies, monographs, and other books, which but few of our workers have, and which, with lack of leisure, but few could sufficiently utilize if they had them. Indexes of literature of given subjects and, especially, abstracts of experimental research are wanted.

One need is a journal for the stations, to contain accounts of their current research, abstracts of similar work in this and in other countries, and other matters of mutual interest. What is wanted is a publication, properly edited, adapted to our special conditions, appearing regularly and giving the latest information, doing for workers in these lines what *Die Landwirthschaftlichen Versuchs-Stationen*, the *Central-Blatt der Agrikulturchemie*, and other publications do for the German stations ; in short, a means to provide prompt and constant intercommunication between the stations and bring them from outside the things they want to know.

Information is also greatly needed in regard to past work and its results. This would be probably best brought to the stations in the form of monographs on special

subjects. The object of these would be to show the actual extent to which certain more important subjects have already been investigated, the methods and results of work done, the specific questions which now most need investigation, and the best means and methods of experimenting. The laws that underlie the problems our stations have to work on, and many of the questions themselves, are the same that have been studied for half a century. It is important to avoid going over old ground, to start where others have left off, and with the benefit of their experience. Such instrumentalities to tell our workers what has been done, and indicate what there is to do and how best to do it, and thus help them to utilize work accomplished instead of doing it over again, would be very useful. For preparing these publications means ought to be provided for securing the services of the ablest specialists in this country and in Europe. All this would cost no little labor, learning, and money, but with the particularly pressing call for every possible assistance of this sort, the expense would bear no comparison to the usefulness; indeed, it is a question whether the stations can afford to be without it.

The Office of Experiment Stations was established October 1, 1888. Its work thus far has been mainly that of organization and the collection of material to be used in future publications. At the outset it put itself in communication with the agricultural colleges and stations throughout the country. One of the first things done was the preparation of an address list of the stations containing the legal name of each, the name and titles of its director, its location, and post-office address. As many of the stations were but recently organized, this list could not be made sufficiently accurate for publication until after the considerable delay occasioned by the passage of numerous letters to and fro between the office and the widely scattered stations. This address list has been supplemented by an organization list containing in addition the name of the college with which each station is connected, the names and titles of the president or other chief officer of the college, the legal designation and constitution of the governing board with the name of each member, and the name, titles, and work of each member of the station staff.

The office has begun a library of station publications, which it hopes to make not only a complete collection of all the publications of the stations organized under national authority, but also of all those issued by the stations previously established in the United States. A card catalogue of the library is kept up to date. Steps have also been taken toward the collection of a general library for the use of the Office. Card catalogues and indexes of literature are contemplated. Indeed the effort is already begun to prepare them in such a way that they may be made conveniently available to station workers and others interested.

On October 12th a circular was sent out to agricultural colleges and experiment stations asking for information concerning the organization, board of management, faculty or working force, courses of study or methods of work, experimental investigations, equipment, revenue, means for publishing results and disseminating information, history peculiarities, and tendencies of each. The information obtained in response to this circular and by an extensive supplementary correspond-

ence is being incorporated in a Report on Agricultural Science and Education in the United States for the coming Paris Exposition. A considerable number of photographs illustrating the buildings, apparatus, farms, live-stock, etc., of various colleges and stations has been collected to form an exhibit at the same Exposition.

Data regarding the history of the general movement for the promotion of agricultural science and education in the United States have also been collected. A brief outline of this history will be published in the Paris Exposition report. It is expected that the work thus far done in this direction will be the basis for a more adequate history of this movement, to be published by this office as soon as practicable.

The office has also aided the executive committee of the Association of American Agricultural Colleges and Experiment Stations in editing the proceedings of the convention held at Knoxville, Tenn., in January, 1889. These will be published at the earliest practicable moment, probably as a bulletin of this office.

This Association, in adopting the recommendation of station horticulturists at the Knoxville convention, expressed its opinion that the stations should co-operate in securing a list of the originators of new and improved fruits, vegetables, etc., for the private use of the stations. This is regarded as a preliminary step toward arrangements to secure a certain degree of uniformity in methods of testing and reporting, in order that the public, as well as the originators, may have a satisfactory guaranty of the value of new varieties and that the indiscriminate introduction of untried sorts may be checked. In conformity with the wish of the convention thus indicated and that of the committee appointed to attend to this matter, as expressed by its chairman in correspondence since, a circular has been sent to the stations requesting them to send to this office a list of such originators. These lists, when received, are forwarded to the chairman of the committee, who is to prepare a classified list of originators for the use of the stations.

A circular has been issued inviting expression of opinion from the stations interested as to the desirability of a meeting for consultation in regard to methods of investigation and co-operative experimenting on plant nutrition and use of fertilizers, including pot, box, and, more especially, field experiments. Previous correspondence had implied a demand for such a conference, and the responses to the circular indicate that quite a number of stations desire to join in a conference upon this and other subjects. Probably the place and date will be decided before this bulletin is printed.

The efforts just named are in the direction of the co-ordination of station work and the co-operative experimenting that is to be desired. Valuable as have been the meetings of the Association of Colleges and Experiment Stations they have not afforded all the opportunity needed for consultation upon such matters. Quite a number of the stations have expressed a wish that other conferences might be held. It has

been suggested that those in the West might have a meeting at some point west of the Mississippi. Several of the stations in the northeastern States have desired to meet in the neighborhood of New York City or Philadelphia. The Association of Official Agricultural Chemists has been in the habit of meeting in Washington in the summer. A considerable number of station officers attend the meetings of the American Association for the Advancement of Science and those of the Society for the Promotion of Agricultural Science, which have been held at the same place and time as those of the American Association.

Whether and to what extent the want here illustrated will be best met by sectional meetings at the conventions of the Association of Agricultural Colleges and Experiment Stations, or in what other ways the object is to be accomplished, are matters worthy of earnest consideration. Doubtless this is one of the problems which experience will have to solve.

PUBLICATIONS CONTEMPLATED.

Just what publications will best meet the needs of the stations on the one hand and on the other convey the fruits of their work to the public whom they are intended to serve, experience must decide.

Bulletins of two classes are now being planned. In those of the one class, which may perhaps be called "Farmers' Bulletins," it is the purpose to collate the results of station work bearing upon special topics, and the teachings of other research, and put the whole into brief, clear, practical form for farmers to read. The bulletins of the other class, which may, with like propriety, be called "Experiment Station Bulletins," will be intended more especially for station workers and others interested in the more abstract scientific matters. Bulletins of both these classes are begun.

A series of monographs on special topics is also contemplated, in accordance with the recommendations of the committee on station work of the Association of American Agricultural Colleges and Experiment Stations, published by the Department of Agriculture nearly a year ago. The following passages are from that report:

There is a quite general call for condensed statement of what is being done by the stations and a number wish to know specifically in advance what the others are proposing to do. The desire for compilation of methods and results of work already done in this direction in this country, and especially in Europe, is earnestly, though less frequently, expressed, and those who are most familiar with that work are the ones who lay the most stress on its being made available to our workers, in order that they may avoid useless repetition of work already done and avail themselves of what is known as to what is most needed to be done and how to do it.

In entering upon the study of a given problem it is essential to know not only what has already been found out, but in what direction further inquiry can best be prosecuted and what experience has to say as to the ways and means. This is, at the bottom, merely the assertion of the obvious principle, that the first condition of successful research is full knowledge of what has been done.

Some of the problems proposed for study, especially those in the newer States and Territories, are comparatively new, but the majority are of essentially the same kinds

that have been engaging the attention of experimenters for many years. Such are those connected with the chemistry and physics of the atmosphere and soil; the exhaustion of the soil and the restoration of its fertility by tillage and manures; the composition of plants and their adaptation to different localities and conditions; the feeding of animals, the production of milk, butter, and cheese, and other matters connected with the dairy; the diseases of plants and animals, fruit culture, and numerous other subjects. To one familiar with the history of this sort of research it is interesting to note how many of the problems suggested for study by the different stations are nearly or quite identical with those with which the work of the experiment stations was begun when the first ones were founded over thirty years ago, and how large a proportion are in fact the same that have been the object of the bulk of the study of these and other institutions of research in this country, in England, and to a far larger extent on the continent of Europe, for half a century.

A large number of the stations will necessarily labor under the disadvantage of inexperience. In other countries the growth of experiment stations has been gradual, and new ones have been established no faster than skilled experts were ready to man them; but in this country the enterprise is being enlarged suddenly and to an extent previously unheard of. The difficulties which the newer stations have to meet from this source are enhanced by the fact that nearly all the accumulated experience is recorded in foreign literature, and accessible only to those who have at hand the great accumulation of journals and other publications in which the results of earlier and later research are set forth.

The committee are strongly of the opinion that one of the most useful services to the cause would consist in the compilation of the main results of this research in various special lines and the putting of them not only into English but in forms conveniently suited to the use of the American investigators. This service would be appreciated as warmly by those who have long endeavored to follow up the literature and are constantly and painfully reminded of their inability to keep themselves well posted in its details as by those who have paid less attention to them.

The form and range which these publications will most advantageously assume must, of course, be decided by experience.

While the object of such monographs would be to give the gist of accumulated experience upon specific topics, bringing the facts down to the date of preparation, accounts of current research are likewise greatly needed. In just what way this need will be met it is impracticable at this date to say, but the matter is receiving earnest consideration. Perhaps the bulletins may develop into a periodical which will meet the demand.

WORK OF INVESTIGATION.

The report of the committee on station work above referred to contained the following statements suggested by extensive correspondence with stations:

Through the communications from representatives of the stations above cited there runs the evident conviction of the importance of doing the kind of work which shall be most directly useful to the farmer. The continued support of the stations will depend upon their success not only in meeting the wants of the agricultural public, but making that public feel that they do so.

With reference to this matter the committee venture two suggestions. One has already been urged. It is that a part of the duty of the stations is to teach, but to teach only well attested and useful facts, By publishing information in terse, simple

language, with appropriate explanations, by attending farmers' meetings, and demonstrating in lectures and otherwise the things that farmers need and desire to know, by interesting farmers in experimental work, and securing their co-operation in carrying it out. In short, by diligent effort to carry knowledge to the farmer and help him with it, and at the same time help him to help himself, the workers in the stations will both do their duty and secure the support they need. Such is the experience of experiment stations and agricultural colleges. There is more than one of our most successful institutions which would not be in existence to-day if it had not done a deal of faithful work of this sort.

The other is that, while the stations are under obligations to select for study the questions of immediate practical interest, yet oftentimes those which on the surface appear theoretical are at the bottom the most practical. The seemingly simplest and most pressing problems reach down to the profoundest depths of abstract law, and not infrequently the practical interests of the farmer require the theoretical problems to be considered first, for the same reason that the foundations of a house and not the wall is the first to be built.

Doubtless it is well that the new stations should go through more or less of the same experience that the older ones have, in commencing with concrete practical questions and gradually working toward the study of the laws that underlie them. This will involve loss of time, energy, and money, in the sense that oftentimes the main result of an experiment will be to show the need of studying a problem that lies beneath it. But this will not be an entire loss, for such experiments often bring valuable information even if the goal is not reached, and they are means of showing the constituency of the stations the need of abstract research. Indeed positive good in many ways comes from just such work and experience. The wisdom consists in insuring the minimum of waste. * * *

It is important to know what fertilizers will be most profitable in New Jersey or in Ohio; what forage plants will best withstand the colds of New Hampshire and Dakota; what fruits may be successfully grown in Iowa and Delaware; how cotton seed may be advantageously composted in Alabama or fed to stock in Mississippi or Texas. These are local questions, and will be solved mainly by practical tests made and interpreted in the light of the best knowledge.

It will help farmers to know what are the most economical rations wherever cattle are fed and the best ways of making butter and cheese where there is dairying. These questions involve more of general laws and are less affected by local conditions.

But whether a given problem is influenced more or less by local circumstances, it is always controlled by general law. The action of fertilizers depends upon the chemistry and physics of the soil and the physiology of the plant; the making of butter upon the chemical and physical properties of the milk; the production of meat and milk upon laws of nutrition; and all these properties and laws are still very imperfectly understood.

Unquestionably the stations ought to make practical experiments in the study of the problems before them. But in the long run, those stations will do best that plan their work most philosophically, and the prosperity of the enterprise as a whole will be proportioned to its success in the discovering of the laws that underlie the right practice of agriculture.

In brief, the ultimate success of the stations will depend upon the discovery of principles. This is accomplished only by patient, profound, costly research, no small part of which has to do with the finding out of the best methods of investigation of special problems. But while this work is essential, the stations are confronted with the necessity of doing what will directly and immediately help the farmer. The need and value of abstract research are not understood. To show its

usefulness and help prepare the way for the stations to prosecute it, and at the same time do some of the things that are most immediately and pressingly needed in these directions, is one of the important ways in which the Department may aid the experiment station enterprise.

As already stated, measures have been undertaken to help in the co-ordinating of the work of the stations and to facilitate co-operation where that is needed. These are being very materially aided by the action of the Association of American Agricultural Colleges and Experiment Stations. Of course this is one of the most important phases of the work of the Department in its connection with the stations, but its successful performance involves no little consultation with the institutions interested and deliberation in the laying of plans so that the best ultimate results will come from efforts which may seem at first rather tardy in their realization.

The cordial appreciation with which the efforts made by this office have been received by the stations and colleges, the readiness with which they have responded to its requests for information, and the earnestness with which they have rallied to its support are most gratifying evidences of the favor with which its establishment is regarded. The number of inquiries for information and requests for assistance from not only the stations and colleges, but from other organizations and from private individuals in this and other countries demonstrate most clearly its opportunity for usefulness.

CHRONOLOGICAL TABLE OF THE ORGANIZATION OF THE EXPERIMENT STATIONS IN THE UNITED STATES.

The following table has been compiled from the data accessible to this office up to the present time. The stations will confer a favor by reporting to this office any errors and furnishing such information as will make it possible to complete the table for future publication.

Unless otherwise specified the reorganization of the stations referred to in this table is that which took place under the act of Congress of March 2, 1887.

The dates of the organization of the Agricultural Experiment Stations in the United States, arranged in chronological order.

State.	Name of Station.	Date of organization.	Remarks.
Conn ..	Connecticut Agricultural Experiment Station.	Oct. 1, 1875	First established in Middletown; reorganized in New Haven in 1877.
Cal	Agricultural Experiment Station of University of California.	— —, 1876	Reorganized March, 1888; outlying stations at Paso Robles, Tulare, Jackson, Cupertino, Fresno, and Mission San José.
N. C.	North Carolina Agricultural Experiment Station.	Mar. 12, 1877	Reorganized in 1887.
N. Y. ..	Cornell University Agricultural Experiment Station.	Feb. —, 1879	By faculty of agriculture of Cornell University; reorganized October 26, 1887.
N. J.	New Jersey State Agricultural Experiment Station.	Mar. 18, 1880	
N. Y.	New York Agricultural Experiment Station.	Mar. 1, 1882	
Ohio ...	Ohio Agricultural Experiment Station	Apr. 25, 1882	Reorganized April 2, 1888.
Tenn ...	Tennessee Agricultural Experiment Station.	June 8, 1882	By trustees of University of Tennessee; reorganized 1887.
Mass ..	Massachusetts State Agricultural Experiment Station.	July —, 1882	Reorganized March, 1888.
Ala	Agricultural Experiment Station of the Agricultural and Mechanical College of Alabama.	June —, 1883	By State; reorganized April 1, 1888.
Wis....	Agricultural Experiment Station of University of Wisconsin.	Oct. 1, 1883	Reorganized 1888.
Me ..	Maine State College Agricultural Experiment Station.	Mar. 3, 1885	Reorganized October 1, 1887.
Ky	Kentucky Agricultural Experiment Station.	Sept. —, 1885	By trustees of College; reorganized by State April, 1886; reorganized under national authority, 1888.
Ala	Canebrake Agricultural Experiment Station.	— —, 1885	By State.
La.	Sugar Experiment Station, No. 1.	Oct. —, 1885	By Sugar Planters' Association.
La.	State Experiment Station, No. 2.	Jan. —, 1886	By State Bureau of Agriculture.
Vt.	Vermont State Agricultural Experiment Station.	Dec. —, 1886	By State.
Pa.	Pennsylvania State College Agricultural Experiment Station.	June 30, 1887	
Nebr...	Agricultural Experiment Station of Nebraska.	July 1, 1887	
Ind	Agricultural Experiment Station of Indiana.	July 1, 1887	
S. C.	South Carolina Agricultural Experiment Station.	Jan. —, 1888	Consolidated in March, 1888, with station established by State in September, 1887.
Nev....	Nevada State Agricultural Station	Jan. 2, 1888	

The dates of the organization of the Agricultural Experiment Stations, etc.—Continued.

State.	Name of Station.	Date of organization.	Remarks.
Mo	Missouri Agricultural Experiment Station.	Jan. 2, 1888	
Tex....	Texas Agricultural Experiment Station	Jan. 25, 1888	
Miss...	Mississippi Agricultural Experiment Station.	Feb. 1, 1888	
Kans ..	Kansas Agricultural Experiment Station.	Feb. 8, 1888	
Iowa ..	Iowa Agricultural Experiment Station.	Feb. 17, 1888	
Colo ...	Agricultural Experiment Station of Colorado.	Feb. 21, 1888	Substations at Del Norte and Rocky Ford.
Mich ..	Experiment Station of Michigan Agricultural College.	Feb. 21, 1888	
Oregon	Oregon Experiment Station.....	Mar. —, 1888	
Mass ..	Hatch Experiment Station of Massachusetts Agricultural College.	Mar. 2, 1888	
Md	Maryland Agricultural Experiment Station.	Mar. 9, 1888	
R. I....	Rhode Island State Agricultural Experiment Station.	Mar. 23, 1888	
Conn ..	Storrs School Agricultural Experiment Station.	Mar. 29, 1888	
Ill	Agricultural Experiment Station of University of Illinois.	Apr. 1, 1888	
La	North Louisiana Experiment Station, No. 3.	Apr. —, 1888	
Va.....	Virginia Agricultural Experiment Station.	May —, 1888	
Del ..	Delaware College Agricultural Experiment Station.	May —, 1888	
Ark ...	Arkansas Agricultural Experiment Station.	— —, 1888	Substations at Pine Bluff, Newport, and Texarkana.
Dak ...	Dakota Agricultural Experiment Station.	— —, 1888	
Fla....	Agricultural Experiment Station of Florida.	— —, 1888	
Ga.....	Georgia Agricultural Experiment Station.	— —, 1888	
Minn ..	Agricultural Experiment Station of University of Minnesota.	— —, 1888	
N. H...	New Hampshire Agricultural Experiment Station.	— —, 1888	
N. J ...	New Jersey Agricultural College Experiment Station.	— —, 1888	
W. Va	West Virginia Experiment Station ...	— —, 1888	

NUMBER OF STATION WORKERS AND THE REVENUES OF THE EXPERIMENT STATIONS IN THE UNITED STATES.

The following table has been compiled from the data reported to this office by the stations up to the date of this writing. The stations will confer a favor by reporting any errors and furnishing such additional information as will make it possible to complete the table for future publication.

Table showing the number of officers composing the Station Staffs of the Agricultural Experiment Stations in the United States, and the revenues of those Stations for the fiscal year ending June 30, 1889, from the United States under the act of Congress of March 2, 1887, from the several States and from other sources.

State.	Name of Station.	No. in Staff.	Annual revenue.		Total.
			From United States.	From other sources.	
Alabama.....	Agricultural Experiment Station of the Agricultural and Mechanical College of Alabama.	10	\$13, 000	a\$10, 000	\$23, 000
Alabama.....	Canebrake Agricultural Experiment Station.	2	2, 000	b2, 500	4, 500
Arkansas.....	Arkansas Agricultural Experiment Station.	10	15, 000	.....	15, 000
California.....	Agricultural Experiment Station of University of California.	16	15, 000	c13, 000	28, 000
Colorado.....	Agricultural Experiment Station of Colorado.	12	15, 000	.....	15, 000
Connecticut.....	Connecticut Agricultural Experiment Station.	9	7, 500	{ b8, 000 d3, 100 }	18, 600
Connecticut.....	Storrs School Agricultural Experiment Station.	5	7, 500	.....	7, 500
Dakota.....	Dakota Agricultural Experiment Station.	11	15, 000	.....	15, 000
Delaware.....	Delaware College Agricultural Experiment Station.	5	15, 000	.....	15, 000
Florida.....	Agricultural Experiment Station of Florida.	.....	15, 000	.....	15, 000
Georgia.....	Georgia Agricultural Experiment Station..	7	15, 000	.....	15, 000
Illinois.....	Agricultural Experiment Station of University of Illinois.	9	15, 000	.....	15, 000
Indiana.....	Agricultural Experiment Station of Indiana.	9	15, 000	e2, 000	17, 000
Iowa.....	Iowa Agricultural Experiment Station.	11	15, 600	.....	15, 000
Kansas.....	Kansas Agricultural Experiment Station.	12	15, 000	.....	15, 000
Kentucky.....	Kentucky Agricultural Experiment Station.	8	15, 000	d1, 500	16, 500
Louisiana.....	Sugar Experiment Station, No. 1.....	7	5, 000	{ b2, 000 f10, 000 g1, 400 }	18, 400
Louisiana.....	State Experiment Station, No. 2.....	4	5, 000	{ b2, 000 g1, 400 }	8, 400
Louisiana.....	North Louisiana Experiment Station, No. 3.	} 2	5, 000	{ b2, 000 h5, 000 }	12, 000
Maine.....	Maine State College Agricultural Experiment Station.	} 10	15, 000	.....	15, 000

a Fertilizer fees.

b State appropriation.

c State appropriation and other sources.

d Analysis fees, etc.

e Proceeds of farm.

f Sugar Planters' Association.

g Tax on fertilizers.

h Parish of Ouachita.

Table showing the number of officers composing the Station Staffs of the Agricultural Experiment Stations in the United States, etc.—Continued.

State.	Name of Station.	No. in Staff.	Annual revenue.		Total.
			From United States.	From other sources.	
Maryland.....	Maryland Agricultural Experiment Station.	6	\$15,000	.....	\$15,000
Massachusetts.....	Massachusetts State Agricultural Experiment Station.	7	.....	b\$10,000	10,000
Massachusetts	Hatch Experiment Station of Massachusetts Agricultural College.	8	15,000	.....	15,000
Michigan	Experiment Station of Michigan Agricultural College.	18	15,000	.....	15,000
Minnesota	Agricultural Experiment Station of University of Minnesota.	12	15,000	.....	15,000
Mississippi	Mississippi Agricultural Experiment Station.	10	15,000	.....	15,000
Missouri.....	Missouri Agricultural College Experiment Station.	9	15,000	.....	15,000
Nebraska	Agricultural Experiment Station of Nebraska.	9	15,000	.....	15,000
Nevada.....	Nevada State Agricultural Station.....	5	15,000	.....	15,000
New Hampshire ...	New Hampshire Agricultural Experiment Station.	9	15,000	.....	15,000
New Jersey.....	New Jersey State Agricultural Experiment Station.	5	.....	b11,000	11,000
New Jersey.....	New Jersey Agricultural College Experiment Station.	5	15,000	.....	15,000
New York.....	New York Agricultural Experiment Station.	7	.....	b20,000	20,000
New York.....	Cornell University Agricultural Experiment Station.	13	15,000	.....	15,000
North Carolina	North Carolina Agricultural Experiment Station.	9	15,000	b2,200	17,200
Ohio	Ohio Agricultural Experiment Station.	7	15,000	.....	15,000
Oregon	Oregon Experiment Station	3	15,000	.....	15,000
Pennsylvania.....	Pennsylvania State College Agricultural Experiment Station.	10	15,000	b3,000	18,000
Rhode Island	Rhode Island State Agricultural Experiment Station.	1	15,000	.....	15,000
South Carolina	South Carolina Agricultural Experiment Station.	13	15,000	g5,000	20,000
Tennessee	Tennessee Agricultural Experiment Station.	7	15,000	g800	15,800
Texas	Texas Agricultural Experiment Station.	11	15,000	.....	15,000
Vermont.....	Vermont State Agricultural Experiment Station.	8	15,000	{ b3,500 e1,000 }	{ 19,500 }
Virginia	Virginia Agricultural Experiment Station.	5	15,000	.....	15,000
West Virginia.....	West Virginia Experiment Station.....	5	15,000	.....	15,000
Wisconsin	Agricultural Experiment Station of University of Wisconsin.	8	15,000	{ b1,000 e1,000 }	{ 20,000 }
	Total.....	369	585,000	125,400	710,400
District Columbia .	United States Department of Agriculture, Office of Experiment Stations.	.....	10,000	.....	10,000
	Grand total.....	.....	595,000	125,400	720,400

b State appropriation.

g Tax on fertilizers.

e Proceeds of farm.

LIST OF AGRICULTURAL SCHOOLS AND COLLEGES IN THE UNITED STATES.

The following list of agricultural schools and colleges in the United States has been compiled from the data accessible to this office up to the present time. In cases where the organization of the institution made it seem desirable so to do, the department especially concerned with agricultural education has been specified and the date of its organization given. The institutions will confer a favor by reporting to this office any errors and such additional information as will make it possible to complete the table for future publication.

List of Agricultural Schools and Colleges in the United States, with location, title and name of chief officer, and date of organization of each institution.

ALABAMA.

Agricultural and Mechanical College, Alabama Polytechnic Institute.—Location, Auburn. President, William LeRoy Brown, M. A., LL. D. Organized by State March, 1872.

ARKANSAS.

Arkansas Industrial University.—Location, Fayetteville. President, Edward Hunter Murfee, A. M., LL. D. Organized by State March 27, 1871.

CALIFORNIA.

College of Agriculture of the University of California.—Location, Berkeley. President, Horace Davis, A. B.; Dean, Irving Stringham, Ph. D. Organized by State March 23, 1868.

COLORADO.

State Agricultural College of Colorado.—Location, Fort Collins. President, Charles L. Ingersoll, M. S. Organized by State March, 1877.

CONNECTICUT.

Sheffield Scientific School of Yale University.—Location, New Haven. President, Timothy Dwight, D. D., LL. D.; Director, George J. Brush, LL. D. Organized in 1847; reorganized in 1860.

Storrs Agricultural School.—Location, Mansfield. Principal, B. F. Koons, A. M., Ph. D. Organized by State in 1881.

DAKOTA.

Dakota Agricultural College.—Location, Brookings. President, Lewis McLouth, A. M., Ph. D. Organized by State in 1884.

DELAWARE.

Delaware College.—Location, Newark. President, Albert N. Raub, A. M., Ph. D. Organized by State in 1834; reorganized in 1851 and 1871.

FLORIDA.

Florida State Agricultural and Mechanical College.—Location, Lake City. President, F. L. Kern. Organized by State in 1884.

GEORGIA.

Georgia State College of Agriculture and Mechanic Arts, of the University of Georgia.—Location, Athens. Chancellor, William E. Boggs, D. D. Organized in 1872.

Southwest Georgia Agricultural College.—Location, Cuthbert. President, Benjamin T. Hunter, A. M. Organized in 1879.

North Georgia Agricultural College.—Location, Dahlonega. President, William S. Basinger, A. M. Organized in 1873.

Middle Georgia Military and Agricultural College.—Location, Milledgeville. President, D. H. Hill, LL. D. Organized in 1880.

South Georgia Agricultural College.—Location, Thomasville. President, G. M. Lovejoy. Organized in 1879.

ILLINOIS.

College of Agriculture of the University of Illinois.—Location, Urbana. Regent, Selim H. Peabody, Ph. D., LL. D.; Dean, George E. Morrow, A. M. Organized by State February, 1867.

INDIANA.

The School of Agriculture, Horticulture, and Veterinary Science of Purdue University.—Location, La Fayette. President, James H. Smart, LL. D. Organized by State August 26, 1873.

IOWA.

Iowa State College of Agriculture and Mechanic Arts.—Location, Ames. President, W. I. Chamberlain. Organized by State in 1858; opened for students October 21, 1863.

KANSAS.

Kansas State Agricultural College.—Location, Manhattan. President, George T. Fairchild, A. M. Organized by State March 3, 1863.

KENTUCKY.

Agricultural and Mechanical College of Kentucky.—Location, Lexington. President, James K. Patterson, Ph. D. Organized by State in 1865; reorganized in 1880.

LOUISIANA.

Louisiana State University and Agricultural and Mechanical College.—Location, Baton Rouge. President, J. W. Nicholson, A. M. Organized by State April 7, 1873; reorganized January 2, 1877.

MAINE.

Maine State College of Agriculture and the Mechanic Arts.—Location, Orono. President, Merritt C. Fernald, A. M., Ph. D. Organized by State in 1865.

MARYLAND.

Maryland Agricultural College.—Location, Agricultural College. President, Henry E. Alvord, C. E. Organized by State in 1856.

MASSACHUSETTS.

Massachusetts Agricultural College.—Location, Amherst. President, Henry H. Goodell, M. A. Organized by State in 1863; opened for students in 1867.

Bussey Institution of Harvard University.—Location, Jamaica Plain. President, Chasles W. Elliott, LL. D.; Dean, F. H. Storer. Organized in 1870 by President and Fellows of Harvard University.

MICHIGAN.

Michigan Agricultural College.—Location, Agricultural College. President, Edwin Willits, LL. D. Organized by State February 12, 1855.

MINNESOTA.

College of Agriculture of the University of Minnesota.—Location, Saint Anthony Park. President, Cyrus Northrop, LL. D. Organized in 1868.

State School of Agriculture of the University of Minnesota.—Location, Saint Anthony Park. Principal, W. W. Pendergast. Organized by Board of Regents in 1888.

MISSISSIPPI.

Agricultural and Mechanical College of Mississippi.—Location, Agricultural College. President, S. D. Lee. Organized by State October, 1830.

Alcorn Agricultural and Mechanical College.—Location, Rodney. President, John H. Burrus, M. A. Organized by State in 1871; reorganized in 1878.

MISSOURI.

Agricultural and Mechanical College of the University of Missouri.—Location, Columbia. Dean, J. W. Sanborn, B. S. Organized by State in 1870.

NEBRASKA.

Industrial College of the University of Nebraska.—Location, Lincoln. Acting Chancellor and Dean, Charles E. Bessey, Ph. D. Organized by State February 15, 1869; opened for students September 7, 1871.

NEVADA.

School of Agriculture of the Nevada State University.—Location, Reno. President, Le Roy D. Brown, A. M., Ph. D. Organized by State in 1887.

NEW HAMPSHIRE.

New Hampshire College of Agriculture and the Mechanic Arts (in connection with Dartmouth College).—Location, Hanover. President, Samuel C. Bartlett, D. D., LL. D.; Dean, Charles H. Pettee, A. M., C. E. Organized by State in 1866.

NEW JERSEY.

Rutgers Scientific School of Rutgers College.—Location, New Brunswick. President, Merrill Edwards Gates, Ph. D., LL. D., L. H. D. Made State College of Agriculture and the Mechanic Arts April 4, 1864.

NEW YORK.

College of Agriculture of Cornell University.—Location, Ithaca. President, Charles Kendall Adams, LL. D. University organized by State April 27, 1865; College organized by trustees of University June 20, 1888.

NORTH CAROLINA.

College of Agriculture and the Mechanic Arts, of the University of North Carolina.—Location, Chapel Hill. President, Kemp P. Battle, LL. D.

OHIO.

Ohio State University.—Location, Columbus. President, William H. Scott, LL.D. Organized by State September 17, 1873.

OREGON.

Oregon State Agricultural College.—Location, Corvallis. President, B. L. Arnold, A. M.

PENNSYLVANIA.

Pennsylvania State College.—Location, State College. President, George W. Atherton, LL. D. Organized in 1859; reorganized in 1862 and 1874.

RHODE ISLAND.

Agricultural and Scientific Department of Brown University.—Location, Providence. President, Ezekiel G. Robinson, D. D., LL. D.

Rhode Island State Agricultural School.—Location, Kingston. President of Board of Managers, Charles O. Flagg, B. S. Organized in 1888.

SOUTH CAROLINA.

College of Agriculture and Mechanic Arts, of the University of South Carolina.—Location, Columbia. President, John M. McBryde, Ph. D., LL. D. Organized in 1879.

Claflin University, College of Agriculture and Mechanics' Institute.—Location, Orangeburg. President, L. M. Dunton, D. D. Organized March 12, 1872.

TENNESSEE.

State Agricultural and Mechanical College of the University of Tennessee.—Location, Knoxville. President, Charles W. Dabney, jr., Ph. D.; Dean, Thomas W. Jordan, A. M. Organized in 1869.

TEXAS.

Agricultural and Mechanical College of Texas.—Location, College Station. Chairman of college faculty, Lewis McInnis, LL. D. Organized April 17, 1871.

VERMONT.

University of Vermont and State Agricultural College.—Location, Burlington. President, Matthew H. Buckham, D. D. Organized November 9, 1865.

VIRGINIA.

Virginia Agricultural and Mechanical College.—Location, Blacksburg. President, L. L. Lomax. Organized in 1872.

Hampton Normal and Agricultural Institute.—Location, Hampton. President, S. C. Armstrong. Organized by American Missionary Society April, 1868; reorganized under charter from State June, 1870.

WEST VIRGINIA.

West Virginia University.—Location, Morgantown. President, E. M. Turner, LL. D. Organized February 2, 1867.

WISCONSIN.

Department of Agriculture of the University of Wisconsin.—Location, Madison. President, T. C. Chamberlin, LL.D. University organized in 1848.

LIST OF EXPERIMENT STATIONS IN THE UNITED STATES, WITH GOVERNING BOARDS AND STATION STAFFS.

Circular No. 1 of this office, which was sent to all the stations, contained a mailing list of experiment stations, with names of directors. The following list includes members of governing boards and of station staffs, with addresses.

At the last meeting of the Association of American Agricultural Colleges and Experiment Stations the desirability of mailing station publications to each member of the working force of the several stations was urged, and the advisability of sending them to the members of the governing boards was also dwelt upon. Like the previous lists, this is as accurate as was practicable to make it from data gathered at the cost of no little correspondence. The stations will confer a favor upon each other as well as upon this office by informing the latter of any errors and keeping it constantly advised of changes, in order that future publications of the list, which are expected to appear at convenient intervals, may be made as correct and as complete as possible. While some stations desire mail to be addressed to the director, others wish communications, including both correspondence and printed matter, addressed, not to individual officers, but to the station in each case. These preferences, so far as it has been practicable to learn them, are stated herewith.

ADDRESS LIST.

It will be an accommodation if publications of the stations are mailed both to *The Secretary of Agriculture, Washington, D. C.*, for the Library of the Department, and to the *Office of Experiment Stations, Department of Agriculture, Washington, D. C.* As several copies of each bulletin are often needed in the office, the stations will confer a favor by sending at least six copies of each to the latter address.

ALABAMA.

AGRICULTURAL EXPERIMENT STATION OF THE AGRICULTURAL AND MECHANICAL COLLEGE OF ALABAMA.

Department of the Agricultural and Mechanical College of Alabama.

W. L. Broun, LL. D., President.

Location of Station, Auburn. Director, J. S. Newman.

GOVERNING BOARD.

Board of Visitors.

Committee of Trustees on Experiment Station :

Hon. J. G. Gilchrist, Hope Hall.

Hon. R. F. Ligon, Tuskegee.

Hon. J. B. Mitchell, Seale.

STATION STAFF.

W. L. Broun, LL. D., President.

J. S. Newman, Director and Agriculturist.

N. T. Lupton, M. D., LL. D., Vice Director and Chemist.

P. H. Mell, M. E., Ph. D., Botanist and Meteorologist.

——, Biologist.

Isaac Ross, First Assistant Agriculturist, in Charge of Live-Stock and Dairy

Jas. Clayton, Second Assistant Agriculturist.

J. T. Anderson, Ph. D., First Assistant Chemist.

L. W. Wilkinson, M. Sc., Second Assistant Chemist.

P. L. Hutchinson, Third Assistant Chemist.

T. D. Samford, B. Sc., Assistant Botanist.

Mail for the Station should be addressed to the Director at Auburn.

CANEBAKE AGRICULTURAL EXPERIMENT STATION.

Department of Agricultural and Mechanical College of Alabama.

W. L. Broun, LL. D., President.

Location of Station, Uniontown. Director, J. S. Newman.

Assistant Director in charge, W. H. Newman, M. Sc.

GOVERNING BOARD.

R. F. Kolb, Commissioner of Agriculture, *ex officio*, Montgomery.

J. S. Newman, Director of State Station, *ex officio*, Auburn.

S. W. John, Secretary, Selma.

H. A. Stoelenwerck, Treasurer, Uniontown.

W. M. Booker, Uniontown.

J. H. Webb, Demopolis.

J. Huggins, M. D., Newbern.

STATION STAFF.

J. S. Newman, Director, *ex officio*, Auburn.

W. H. Newman, M. Sc., Assistant Director in charge, Uniontown.

H. C. Smith, Superintendent of Farm, Uniontown.

Mail for the Station should be addressed to Canebake Station.

ARKANSAS.

ARKANSAS AGRICULTURAL EXPERIMENT STATION.

Department of Arkansas Industrial University.

E. H. Murfee, LL. D., President.

Location of Station, Fayetteville. Director, A. E. Menke, D. Sc.

Substations at Pine Bluff, Newport, and Texarkana.

GOVERNING BOARD.

Agricultural Committee of Board of Trustees of Arkansas Industrial University.

J. W. Keesee, Latour.

C. M. Taylor, M. D., South Bend.

W. F. Avera, Camden.

Members ex officio.

E. H. Murfee, LL. D., President.

A. E. Menke, D. Sc., Director.

STATION STAFF.

A. E. Menke, D. Sc., Director.
 F. W. Simonds, Ph. D., Biologist.
 S. S. Twombly, B. S., Chemist.
 E. S. Richman, B. S., Horticulturist.
 R. R. Dinwiddie, M. D., V. S., Veterinarian.
 C. B. Collingwood, B. S., Chemist.
 C. W. Woodworth, B. S., Entomologist.
 G. A. Humphrey, Assistant Chemist.
 C. F. Cory, B. S., Assistant Agriculturist, Pine Bluff.
 J. K. Fitzgerald, B. S., Assistant Agriculturist, Newport.
 ———, Assistant Agriculturist, Texarkana.

Mail for the Station should be addressed to the Director.

CALIFORNIA.

AGRICULTURAL EXPERIMENT STATION OF THE UNIVERSITY OF CALIFORNIA.

Department of the University of California.

Horace Davis, A. B., President.

Location of Station, Berkeley. Director, E. W. Hilgard, Ph. D., LL. D.

GOVERNING BOARD.

Board of Regents.

Ex officio.

His Excellency R. W. Waterman, Governor, President *ex officio*, Sacramento.
 His Honor Stephen M. White, Lieutenant Governor, Los Angeles.
 Hon. W. H. Jordan, Speaker of the Assembly, Oakland.
 Hon. Ira G. Hoitt, State Superintendent of Public Instruction, Sacramento
 Hon. L. U. Shippee, President of State Agricultural Society, Stockton.
 Horace Davis, President of the University, Berkeley.

Appointed.

Rev. Horatio Stebbins, 1609 Larkin street, San Francisco.
 John S. Hager, Palace Hotel, San Francisco.
 J. West Martin, Oakland.
 C. F. Crocker, Fourth and Townsend streets, San Francisco.
 A. S. Hallidie, 329 Market street, San Francisco.
 John L. Beard, Centreville.
 James F. Houghton, Palace Hotel, San Francisco.
 Columbus Bartlett, Berkeley.
 T. G. Phelps, Belmont.
 George T. Marye, jr., 234 Montgomery street, San Francisco.
 Arthur Rodgers, Nevada block, Montgomery street, San Francisco.
 George T. Ainsworth, North Temescal.
 D. M. Delmas, San Francisco.
 William T. Wallace, 799 Van Ness avenue, San Francisco.
 I. W. Hellman, Los Angeles.
 Albert Miller, Oakland.

STATION STAFF.

E. W. Hilgard, Ph. D., LL. D., Director.
 E. J. Wickson, A. M., Superintendent of Grounds.
 F. W. Morse, Ph. B., Assistant in Agricultural Laboratory.
 M. E. Jaffa, Ph. B., Assistant in Viticultural Laboratory.
 George E. Colby, Ph. B., Assistant in Viticultural Laboratory.
 A. H. Weber, Ph. B., Met. E., Assistant in Experiment Station.
 K. McLennan, Foreman of Station Grounds.

OUTLYING STATIONS.

I. *General Culture Stations.*

For Southern Coast Range Region.—Location, Paso Robles. Patron, Hon. J. V. Webster. Foreman, R. D. Cruickshank.

For San Joaquin Valley.—Location, Tulare. Patron, B. F. Moore. Foreman, Julius Forrer.

For Sierra Foot-hill Region.—Location, Jackson. Patron, Hon. A. Caminetti. Foreman, George Hansen.

II. *Grape Culture Stations.*

For West Side Santa Clara Valley.—Location, Cupertino. Patron, Hon. John T. Doyle.

Fresno Station.—Location, Fresno. Patron, E. B. Rogers.

For East Side Santa Clara Valley.—Location, Mission San José. Patron, John Gallegos.

Mail for the Stations should be addressed to the Station at Berkeley.

COLORADO.

AGRICULTURAL EXPERIMENT STATION OF COLORADO.

Department of the State Agricultural College.

Charles L. Ingersoll, M. S., President.

Location of Station, Fort Collins. Director, Charles L. Ingersoll, M. S.

GOVERNING BOARD.

Executive Committee in Charge.

Hon. John J. Ryan, Loveland.

Hon. W. F. Watrous, Fort Collins.

Hon. George Wyman, Longmont.

STATION STAFF.

Charles L. Ingersoll, M. S., Director.

Frank J. Annis, M. S., Secretary and Treasurer.

Ainsworth E. Blount, A. M., Agriculturist.

James Cassidy, B. S., Botanist and Horticulturist.

David O'Brine, E. M., D. Sc., M. D., Chemist.

Louis G. Carpenter, M. S., Meteorologist and Irrigation Engineer.

William McEachran, M. D., V. S., Veterinarian.

Ransom H. McDowell, B. S., Assistant Agriculturist.

C. Max Brose, Assistant Horticulturist.

L. A. Coffin, B. S., Assistant Chemist.

Harvey H. Griffin, B. S., Assistant in charge San Luis Valley Agricultural Experiment Station, Del Norte.

Frank Watrous, Assistant in charge Bent Agricultural Experiment Station, Rocky Ford.

Mail for the Station should be addressed to the Director.

CONNECTICUT.

THE CONNECTICUT AGRICULTURAL EXPERIMENT STATION.

Location of Station, New Haven. Director, Samuel W. Johnson, M. A.

GOVERNING BOARD.

State Board of Control.

His Excellency, Governor Morgan G. Bulkeley, President.

Appointed by Connecticut State Agricultural Society :

Hon. E. H. Hyde, Vice President, Stafford.

Appointed by Board of Trustees of Wesleyan University :

W. O. Atwater, Ph. D., Middletown.

Appointed by Governor and Senate :

Edwin Hoyt, New Canaan.

H. L. Dudley, New London.

Appointed by Board of Agriculture :

T. S. Gold, West Cornwall.

Appointed by Governing Board of Sheffield Scientific School :

W. H. Brewer, Ph. D., Secretary and Treasurer, New Haven.

S. W. Johnson, Director of Station, *ex officio*, New Haven.

Executive Committee.

T. S. Gold.

S. W. Johnson.

W. H. Brewer.

STATION STAFF.

Samuel W. Johnson, M. A., Director.

E. H. Jenkins, Ph. D., Vice Director and Chemist.

A. L. Winton, jr., Ph. B., Chemist.

T. B. Osborne, Ph. D., Chemist.

R. S. Curtiss, Ph. B., Chemist.

Roland Thaxter, Ph. D., Mycologist.

Frances M. Bigelow, Librarian and Clerk.

Hugo Lange, Assistant.

Charles J. Rice, in charge of buildings and grounds.

Mail for the Station should be addressed to the Station.

STORRS SCHOOL AGRICULTURAL EXPERIMENT STATION.

Connected with Storrs Agricultural School.

B. F. Koons, Ph. D., Principal.

Location of Station, Storrs, Tolland County. Director, W. O. Atwater,* Ph. D.

GOVERNING BOARD.

Board of Trustees of the Storrs Agricultural School.

His Excellency, Governor Morgan G. Bulkeley, President *ex-officio*.

Hon. E. H. Hyde, Vice President, Stafford.

Hon. T. S. Gold, Secretary, West Cornwall.

J. P. Barstow, Treasurer, Norwich.

William E. Simonds, Hartford.

J. M. Hubbard, Middletown.

H. C. Miles, Milford.

J. H. Hale, South Glastonbury.

S. W. Johnson, Director Connecticut Agricultural Experiment Station, *ex officio*, New Haven.

Executive Committee.

Hon. T. S. Gold, West Cornwall.

J. M. Hubbard, Middletown.

B. F. Koons, Ph. D., Storrs.

STATION STAFF.

W. O. Atwater,* Ph. D., Director, Middletown.

C. S. Phelps, B. Sc., Vice Director, Storrs.

C. D. Woods, B. Sc., Chemist, Middletown.

H. B. Gibson, A. B., Assistant Chemist, Middletown.

E. A. Bailey, Assistant in Farm Experiments, Storrs.

Mail for the Station should be addressed to Agricultural Experiment Station, Storrs, Conn.

DAKOTA.

DAKOTA AGRICULTURAL EXPERIMENT STATION.

Department of Dakota Agricultural College.

Lewis McLouth, Ph. D., President.

Location of Station, Brookings. Director, Lewis McLouth, Ph. D.

GOVERNING BOARD.

Board of Regents.

Fred. E. Lally, Estelline.

Chester M. Durley, Brookings.

Charles Keith, Volga.

George Morehouse, Brookings.

Oscar P. Kemp, Watertown.

George G. Crose, Aberdeen.

Governor L. K. Church, *ex officio*, Bismarck.

STATION STAFF.

Lewis McLouth, Ph. D., Director.

Luther Foster, M. Sc., Superintendent Farm Experiments.

Charles A. Keffler, Superintendent Forestry and Horticultural Experiments.

I. H. Orcutt, M. D., Ph. D., Entomologist.

James H. Shepard, M. S., Analytical Chemist.

Clement J. Alloway, V. S., Veterinarian.

Charles J. Cotey, B. Sc., Accountant and Stenographer.

Nancy L. Van Doren, Librarian.

James A. Duffey, B. S., Foreman of Forestry and Garden Experiment Work.

William C. Copeland, Foreman of Farm.

William Lawson, Herdsman.

Mail for the Station should be addressed to the Director.

* At present in charge of Office of Experiment Stations, Department of Agriculture, Washington, D. C.

DELAWARE.

THE DELAWARE COLLEGE AGRICULTURAL EXPERIMENT STATION.

Department of Delaware College.

A. N. Raub, Ph. D., President.

Location of Station, Newark. Director, Arthur T. Neale, Ph. D.

GOVERNING BOARD.

Board of Control.—Trustees of Delaware College.

Representing the original board :

Lewis P. Bush, M. D., Wilmington.

S. M. Curtis, Newark.

George G. Evans, Newark.

Hon. John W. Houston, Dover.

David J. Murphy, Newark.

William H. Purnell, LL. D., Frederick.

John F. Williamson, Newark.

George W. Cruikshank, Elkton.

Manlove Hayes, Dover.

James Hossinger, Newark.

Peter D. Keyser, M. D., Philadelphia, Pa.

H. G. M. Kollock, M. D., Newark.

George W. Marshall, M. D., Milford.

John C. Higgins, Delaware City.

On behalf of the State of Delaware :

New Castle County. Hon. Benjamin T. Biggs, Middletown.

Dr. C. Elton Buck, Wilmington.

William J. Ferris, New Castle.

Hon. Charles B. Lore, Wilmington.

John A. Reynolds, Middletown.

Kent County J. Alexander Fulton, Dover.

Hon. John B. Pennington, Dover.

John C. Stockley, Smyrna.

John F. Saulsbury, Dover.

John H. Bewley, Smyrna.

Sussex County. William F. Causey, Milford.

Hon. Charles C. Stockley, Georgetown.

Hugh Martin, M. D., Seaford.

David L. Mustard, M. D., Lewes.

Edwin R. Paynter, Georgetown.

STATION STAFF.

Arthur T. Neale, Ph. D., Director.

Frederick D. Chester, M. S., Botanist.

George A. Harter, A. M., Meteorologist.

M. H. Beckwith, Horticulturist and Entomologist.

Charles L. Penny, A. M., Assistant Chemist.

——, Veterinarian.

Mail for the Station should be addressed to the Director.

FLORIDA.

AGRICULTURAL EXPERIMENT STATION OF FLORIDA.

Department of Florida State Agricultural and Mechanical College.

F. L. Kern, President.

Location of Station, Lake City. Director, Rev. J. P. De Pass.

No reports received.

GEORGIA.

GEORGIA AGRICULTURAL EXPERIMENT STATION.

Department of State College of Agriculture and Mechanic Arts, University of Georgia.

Rev. William E. Boggs, D. D., Chancellor.

Location of Station, Athens. Director, W. L. Jones, M. D.

GOVERNING BOARD.

Board of Control.

A. L. Hull, Chairman, Athens.

Pope Barrow, Athens.

A. S. Erwin, Athens.

W. H. Felton, Marshallville.

Joel A. Billups, Madison.

H. D. McDaniel, Monroe.

C. Z. McCord, Augusta.

STATION STAFF.

W. L. Jones, M. D., University Professor of Agriculture, Director.

H. C. White, Ph. D., University Professor of Chemistry, Chemist.

L. H. Charbonnier, Ph. D., University Professor of Physics, Meteorologist.

J. P. Campbell, Ph. D., University Professor of Biology, Entomologist.

J. W. Spencer, Ph. D., University Professor of Geology, Geologist.

C. M. Strahan, C. E., M. E., Assistant Chemist.

Edward Bancroft, M. A., Agriculturist.

Mail for the Station should be addressed to Experiment Station.

ILLINOIS.

AGRICULTURAL EXPERIMENT STATION OF THE UNIVERSITY OF ILLINOIS.

Department of the University of Illinois,

Selim H. Peabody, Ph. D., LL. D., Regent.

Location of Station, Champaign. Director, Selim H. Peabody, Ph. D., LL. D.

GOVERNING BOARD.

Selim H. Peabody, Ph. D., LL. D., Regent, President, Champaign.

E. E. Chester, State Board of Agriculture, Champaign.

James T. Johnson, State Horticultural Society, Warsaw.

H. B. Gurler, State Dairymen's Association, DeKalb.

Emory Cobb, Trustee University of Illinois, Kankakee.

Burden Pullen, Trustee University of Illinois, Centralia.

George E. Morrow, A. M., Professor of Agriculture, University of Illinois, Champaign.

Thomas J. Burrill, A. M., Ph. D., Professor of Botany and Horticulture, University of Illinois, Urbana.

STATION STAFF.

Selim H. Peabody, Ph. D., LL. D., Director.

William L. Pillsbury, A. M., Secretary.

George E. Morrow, A. M., Agriculturist.

Thomas J. Burrill, Ph. D., Horticulturist and Botanist.

Donald McIntosh, V. S., Veterinarian.

Thomas F. Hunt, S. B., Assistant Agriculturist.

George W. McCluer, S. B., Assistant Horticulturist.

Albert G. Manns, Ph. D., Assistant Chemist.

Harry S. Grindley, S. B., Assistant Chemist.

Mail for the Station should be addressed to the Director.

INDIANA.

AGRICULTURAL EXPERIMENT STATION OF INDIANA.

Department of Purdue University.

James H. Smart, LL. D., President.

Location of Station, La Fayette. Director, Horace E. Stockbridge, Ph. D.

GOVERNING BOARD.

The Board of Control.

Charles B. Stuart, President, La Fayette.

Alfred P. Edgerton, Fort Wayne.

Samuel Hargrove, Princeton.

William A. Banks, La Porte.

Addison Bybee, Indianapolis.

William H. Ragan, Greencastle.

Moses C. Stevens, Secretary, La Fayette.

Martin L. Peirce, Treasurer, La Fayette.

James H. Smart, LL. D., La Fayette.

STATION STAFF.

Horace E. Stockbridge, Ph. D., Director.

Carl W. Wulff, R. S. A., M. S., Assistant Director.

William C. Latta, M. S., Agriculturist.

James Troop, M. S., Horticulturist.

Henry A. Huston, A. C., Chemist.

Joseph C. Arthur, D. Sc., Botanist.

Francis M. Webster, Special Agent U. S. Division of Entomology, Entomologist.

Therics D. Hinebauch, M. S., V. S., Veterinarian.

Pierre Van Landeghem, Florist.

Mail for the Station should be addressed to the Director.

IOWA.

IOWA AGRICULTURAL EXPERIMENT STATION.

Department of Iowa State College of Agriculture and Mechanic Arts.

W. I. Chamberlain, LL. D., President.

Location of Station, Ames. Director, R. P. Speer.

GOVERNING BOARD.

Committee of the College Board of Trustees on Experiment Station.

Hon. J. W. Garner, Columbus City.

Hon. Joseph Dysart, Dysart.

Hon. C. M. Dunbar, Maquoketa.

STATION STAFF.

R. P. Speer, Director.

John Craig, Assistant.

Herman Knapp, Treasurer.

G. E. Patrick, M. Sc., Chemist.

A. A. Crozier, M. Sc., Botanist.

C. P. Gillette, M. Sc., Entomologist.

Alfred A. Bennett, M. Sc., Chemist (special work).

Byron D. Halsted, D. Sc., Botanist (special work).

J. L. Budd, M. H., Horticulture (special work).

Loren P. Smith, M. Sc., Agriculture (special work).

M. Stalker, M. Sc., V. S., Veterinary Science (special work).

Mail for the Station should be addressed to the Director.

KANSAS.

KANSAS AGRICULTURAL EXPERIMENT STATION.
 Department of Kansas State Agricultural College.
 George T. Fairchild, A. M., President.

Location of Station, Manhattan. Director, E. M. Shelton, M. Sc.

GOVERNING BOARD.

Board of Regents.

Hon. A. P. Forsyth, President, Liberty.
 Hon. E. N. Smith, Vice President, El Dorado.
 Hon. John E. Hessin, Treasurer, Manhattan.
 Hon. T. P. Moore, Loan Commissioner, Holton.
 Hon. Thomas Henshall, Wyandotte.
 Hon. Joshua Wheeler, Nortonville.
 George T. Fairchild, A. M., President of the College (*ex officio*), Secretary.

STATION STAFF.

Council of Station.

George T. Fairchild, A. M., President of the College, Chairman.
 Edward M. Shelton, M. Sc., Director and Professor of Agriculture.
 George H. Failyer, M. Sc., Professor of Chemistry.
 Edwin A. Popenoe, A. M., Professor of Horticulture and Entomology
 William A. Kellerman, Ph. D., Professor of Botany.
 Robert F. Burleigh, D. V. S., Professor of Veterinary Science.
 Henry Cottrell, M. Sc., Assistant in Agriculture.
 Julius T. Willard, M. Sc., Assistant in Chemistry.
 Charles L. Marlatt, M. Sc., Assistant in Entomology.
 William Shelton, Foreman of Farm.
 Silas C. Mason, Foreman of Gardens.
 Walter T. Swingle, Assistant in Botany.

Mail for the Station should be addressed to the Director.

KENTUCKY.

KENTUCKY AGRICULTURAL EXPERIMENT STATION.
 Department of the Agricultural and Mechanical College of Kentucky.
 James K. Patterson, Ph. D., President.

Location of Station, Lexington. Director, M. A. Scovell, M. S.

GOVERNING BOARD.

Board of Trustees of the Agricultural and Mechanical College of Kentucky.

Board of Control, subject to Board of Trustees.

R. J. Spurr, M. D., Chairman, Greendale.
 Hon. W. B. Kinkead, Lexington.
 W. D. Nicholas, Treasurer, Lexington.
 Philemon Bird, Shelbyville.
 R. A. Spurr, Chilesburg.
 James K. Patterson, Ph. D., President of College.
 M. A. Scovell, M. S., Director, Secretary.

STATION STAFF.

M. A. Scovell, M. S., Director and Chemist.
 A. M. Peter, M. S., Assistant Chemist.
 H. E. Curtis, B. S., Second Assistant Chemist.
 A. R. Crandall, Ph. D., Botanist.
 J. H. Connell, B. S., Agriculturist.
 A. T. Parker, Microscopist.
 James Murray, Farm Superintendent.
 C. L. Curtis, Farm Foreman.

Mail for the Station should be addressed to the Director.

LOUISIANA.

- NO. 1. SUGAR EXPERIMENT STATION, KENNER.
 NO. 2. STATE EXPERIMENT STATION, BATON ROUGE.
 NO. 3. NORTH LOUISIANA EXPERIMENT STATION, CALHOUN.

Department of Louisiana State University and Agricultural and Mechanical College, Col. J. W. Nicholson, President.

Location of Stations, No. 1, Kenner; No. 2, Baton Rouge; No. 3, Calhoun.
 Director, William C. Stubbs, Ph. D.

GOVERNING BOARD.

State Bureau of Agriculture.

Ex officio.

Governor Francis T. Nicholls, Baton Rouge.

Maj. T. J. Bird, Commissioner of Agriculture, Baton Rouge.

William Garig, Vice President Board of Supervisors of University, Baton Rouge.

STATION STAFF.

Sugar Experiment Station.

William C. Stubbs, Ph. D., Director.
 Maurice Bird, B. S., Assistant and Chemist.
 J. P. Baldwin, In charge of Sugar-house, Kenner.
 C. F. Fyler, Assistant in Sugar-house, Kenner.
 Russell Billien, Assistant in Laboratory.
 J. G. Lee, B. S., In charge of Diffusion.
 William Shiel, In charge of Field Experiments

State Experiment Station.

William C. Stubbs, Ph. D., Director.
 D. N. Barrow, B. S., Assistant Director.
 B. B. Ross, M. S., Chemist.
 A. T. Prescott, A. M., Biologist.
 August Wisen, Foreman on Farm.

North Louisiana Experiment Station

William C. Stubbs, Ph. D., Director.
 Jordan G. Lee, B. S., Assistant and Chemist.
 L. M. Calhoun, Farm Manager.

Mail for any one of the Stations should be addressed to the Director at that Station.

MAINE.

MAINE STATE COLLEGE AGRICULTURAL EXPERIMENT STATION.
Department of State College of Agriculture and the Mechanic Arts.

Merritt C. Fernald, Ph. D., President.

Location of Station, Orono. Director, Whitman H. Jordan, M. S.

GOVERNING BOARD.

Station Council.

Merritt C. Fernald, Ph. D., President of College, President.

Whitman H. Jordan, M. S., Director of Station, Secretary.

Walter Balentine, M. S., Professor of Agriculture in College.

F. L. Harvey, M. S., Professor of Natural History in College.

F. L. Russell, V. S., Veterinarian of Station.

STATION STAFF.

Whitman H. Jordan, M. S., Director.

Merritt C. Fernald, Ph. D., Meteorologist.

Walter Balentine, M. S., Experimental Agriculture.

F. L. Harvey, M. S., Botanist and Entomologist.

F. L. Russell, V. S., Veterinarian.

J. M. Bartlett, M. S., Chemist.

L. H. Merrill, B. S., Chemist.

F. P. Briggs, Assistant in Botany and Entomology.

A. M. Shaw, Foreman on Farm.

Mrs. Jennie Waite, Clerk.

Mail for the Station should be addressed to the Director.

MARYLAND.

MARYLAND AGRICULTURAL EXPERIMENT STATION.

Department of Maryland Agricultural College.

Henry E. Alvord, C. E., President.

Location of Station, Agricultural College P. O. Director, Henry E. Alvord, C. E.

GOVERNING BOARD.

Board of Trustees.

Members *ex officio* under State law :

His Excellency E. E. Jackson, Governor, President of the Board, Annapolis.

Hon. George Peter, President of the Senate, Annapolis.

Hon. George M. Upshur, Speaker of the House of Delegates, Annapolis.

Hon. William Pinkney Whyte, Attorney-General, Annapolis.

Hon. Stevenson Archer, State Treasurer, Annapolis.

Hon. L. Victor Baughman, Comptroller, Annapolis.

Hon. Norman J. Colman, U. S. Secretary of Agriculture, Washington, D. C.

Members elected by the stockholders :

Hon. J. Carroll Walsh, Jerusalem Mills.

Hon. Wilmot Johnson, Catonsville.

Charles B. Calvert, Agricultural College P. O.

Robert A. Dobbin, Saint Denis.

Allen Dodge, Auditor, Washington, D. C.

Members by executive appointment :

F. Carroll Goldsborough, Easton.
 David Seibert, Clear Spring.
 George R. Willis, Baltimore.
 Charles A. Wells, M. D., Auditor, Hyattsville.
 Jeremiah P. Silver, Glenville.
 A. P. Sharp, M. D., Rock Hall.

Special Governing Committee of the Board of Trustees.

Hon. Norman J. Colman, U. S. Secretary of Agriculture, Washington, D. C.
 F. Carroll Goldsborough, Easton.
 Hon. George Peter, Annapolis.
 David Seibert, Clear Spring.
 A. P. Sharp, M. D., Rock Hall.

STATION STAFF.

Henry E. Alvord, C. E., Director.
 Harry J. Patterson, B. S., Chemist.
 William H. Bishop, B. S., Horticulturist.
 Albert L. Hayward, B. S., Agriculturist.
 Ernest H. Brinkley, Machinist.
 Elmer M. Dunn, Stenographer.
 W. Horace Soper, Registrar, or Treasurer.

Mail for the Station should be addressed to the Director.

MASSACHUSETTS.**MASSACHUSETTS STATE AGRICULTURAL EXPERIMENT STATION.**

Location of the Station, Amherst. Director, Charles A. Goessmann, Ph. D.

GOVERNING BOARD.*Board of Control.*

His Excellency Oliver Ames, Governor of the Commonwealth, President *ex officio*.
 Appointed by the State Board of Agriculture :

J. P. Lynde, M. D., Treasurer, Athol.
 W. W. Rawson, Arlington.

Appointed by the Board of Trustees of the Massachusetts Agricultural College :

J. H. Demond, Northampton.
 Hon. T. P. Root, Barre.

Appointed by the Massachusetts Society for Promoting Agriculture :

F. H. Appleton, Peabody.

Appointed by the Massachusetts State Grange :

Elbridge Cushman, Lakeville.

Appointed by the Massachusetts Horticultural Society :

William C. Strong, Newton Highlands.

H. H. Goodell, A.M., President of the Massachusetts Agricultural College, Amherst.
 Charles A. Goessmann, Ph. D., Director, Amherst.

Hon. W. R. Sessions, Secretary of the State Board of Agriculture, Secretary and Auditor, Hampden.

STATION STAFF.

Charles A. Goessmann, Ph.D., Director and Chemist.
 J. E. Humphrey, S. B., Vegetable Physiologist.
 W. H. Beal, A. B., M. E., Assistant, General and Analytical Chemistry.
 E. R. Flint, B. S., Assistant, General and Analytical Chemistry.
 R. B. Moore, B. S., Assistant, General and Analytical Chemistry.
 E. E. Knapp, B. S., Assistant, General and Analytical Chemistry
 W. A. Parsons, B. S., Assistant, Field Experiments and Stock-Feeding.
 David Wentzell, Farmer.

Mail for the Station should be addressed to the Director.

HATCH EXPERIMENT STATION OF THE MASSACHUSETTS AGRICULTURAL COLLEGE.

Department of the Massachusetts Agricultural College.

Henry H. Goodell, A. M., President.

Location of Station, Amherst. Director, Henry H. Goodell, M. A.

GOVERNING BOARD.

Committee on Experiment Department of the Massachusetts Agricultural College.

Hon. William R. Sessions, Secretary of the Massachusetts State Board of Agriculture, Chairman, Commonwealth Building, Boston.

Hon. Daniel Needham, Chairman Finance Committee, Groton.

William Wheeler, B. Sc., Chairman Committee on Faculty and Course of Study, Concord.

James Draper, Worcester.

Elijah W. Wood, West Newton.

Henry H. Goodell, M. A., Secretary, Amherst.

STATION STAFF.

The Council of the Hatch Experiment Station of the Massachusetts Agricultural College.

Henry H. Goodell, M. A., Director.

William P. Brooks, B. Sc., Agriculturist.

Samuel T. Maynard, B. Sc., Horticulturist.

Charles H. Fernald, Ph. D., Entomologist.

Clarence D. Warner, B. Sc., Meteorologist.

Frank E. Paige, Treasurer.

J. Howe Demond, Auditor.

Mail for the Station should be addressed to "Hatch Experiment Station."

MICHIGAN.

EXPERIMENT STATION OF MICHIGAN AGRICULTURAL COLLEGE.
Department of Michigan Agricultural College.

Edwin Willits, M. A., President.

Location of Station, Agricultural College. Director, Edwin Willits, M. A.

GOVERNING BOARD

State Board of Agriculture.

Hon. Franklin Wells, President, Constantine.

Hon. William B. Creery, Flint.

Hon. Charles W. Garfield, M. S., Grand Rapids.

Hon. O. Palmer, Grayling.

Hon. A. C. Glidden, Paw Paw.

Gov. Cyrus G. Luce, *ex officio*, Lansing.

Edwin Willits, M. A., *ex officio*, President of College, Agricultural College.

Hon. Henry G. Reynolds, M. S., Secretary, Agricultural College.

STATION STAFF.

Edwin Willits, M. A., Director.

Samuel Johnson, M. S., Professor of Agriculture.

Robert Kedzie, M. D., Professor of Chemistry.

William J. Beal, M. S., Ph. D., Professor of Botany.

Albert J. Cook, M. S., Professor of Entomology.

L. R. Taft, M. S., Professor of Horticulture.

E. A. A. Grange, V. S., Professor of Veterinary Science.

H. G. Reynolds, M. S., Secretary and Treasurer.

Frank S. Kedzie, M. S., Assistant in Chemistry.

George L. Tillen, B. S., Assistant in Chemistry.

Lyster H. Dewey, B. S., Assistant in Botany.

Eugene Davenport, M. S., Assistant in Botany.

Arthur B. Cordley, B. S., Assistant in Entomology.

Charles B. Cook, B. S., Assistant in Entomology.

Charles S. Crandall, B. S., Assistant in Horticulture.

Nelson S. Mayo, B. S., Assistant in Veterinary Science.

H. T. Finch, B. S., Assistant in Agriculture.

A. Johnson, B. S., Assistant in Agriculture.

Mail for the Station should be addressed to the Director.

MINNESOTA.

AGRICULTURAL EXPERIMENT STATION OF THE UNIVERSITY OF MINNESOTA.

Department of the University of Minnesota.

Cyrus Northrop, LL. D., President.

Location of Station, Saint Anthony Park. Director, Edward D. Porter, Ph. D.

GOVERNING BOARD.

Board of Regents.

Hon. Greenleaf Clark, M. A., Saint Paul.

Hon. Cushman K. Davis, M. A., Saint Paul.

Hon. Knute Nelson, Alexandria.

Hon. John S. Pillsbury, Minneapolis.

Hon. Henry S. Sibley, LL. D., Saint Paul.

Hon. Gordon E. Cole, Faribault.

Hon. William Liggett, Beuson.

Hon. William R. Merriam, Governor of the State, *ex officio*, Saint Paul.
 Hon. David L. Kiehle, M. A., State Superintendent of Public Instruction, *ex officio*,
 Saint Paul.
 Cyrus Northrop, LL. D., President of University, *ex officio*, Minneapolis.

Officers of the Board.

Hon. Henry H. Sibley, President.
 Hon. David L. Kiehle, Recording Secretary.
 Cyrus Northrop, President of University, Corresponding Secretary.
 H. P. Brown, Treasurer.

STATION STAFF.

Officers of the Station.

Edward D. Porter, Ph. D., Director and Agriculturist.
 Willet M. Hays, B. S. A., Assistant in Agriculture.
 Samuel B. Green, B. S., Horticulturist.
 Charles Pomeroulie, Assistant in Horticulture.
 Otto Lugger, Ph. D., Entomologist and Botanist.
 David N. Harper, Ph. D., Chemist.
 Olaf Schwartzkopff, V. D. S., Veterinarian.
 Daniel W. Sprague, Accountant and Recorder.
 M. Estelle Porter, B. L., Secretary and Stenographer.
 Peter M. Gideon, Superintendent of Minnetonka Fruit Farm.
 E. H. S. Dartt, Superintendent of Owatonna Forest Tree Station.
 E. H. Delhorbe, Farm Foreman.

Mail for the Station should be addressed to the Director.

MISSISSIPPI.

MISSISSIPPI AGRICULTURAL EXPERIMENT STATION.
 Department of Mississippi State Agricultural College.
 General S. D. Lee, President.

Location of Station, Agricultural College. Director, S. M. Tracy, M. S.

GOVERNING BOARD.

Trustees.

His Excellency Robert Lowry, Governor, President, *ex officio*.
 T. F. Watson, Secretary.
 Hon. H. M. Street, Meridian.
 H. S. Minor, M. D., Macon.
 W. B. Montgomery, Starkville.
 Hon. J. Z. George, Jackson.
 Hon. L. B. Brown, Enterprise.
 George H. Peets, M. D., Woodville.
 Hon. J. R. Cameron, Canton.
 Hon. J. M. Stone, Iuka.
 T. C. Dockery, Hernando.
 Hon. W. L. Hemingway, Treasurer, Jackson.

Committee acting for Trustees.

General S. D. Lee, Agricultural College.
 W. B. Montgomery, Starkville.
 S. M. Tracy, M. S., Agricultural College.

STATION STAFF.

S. M. Tracy, M. S., Director.
 E. R. Lloyd, M. S., Assistant Director.
 B. Irby, M. S., Agriculturist.
 A. B. McKay, B. S., Horticulturist.
 B. W. Saffold, B. S., Assistant Horticulturist.
 D. L. Phares, A. M., M. D., Veterinarian.
 W. L. Hutchinson, B. S., Chemist.
 B. von Herff, Ph. D., Assistant Chemist.
 L. G. Patterson, Assistant Chemist.
 B. W. Kilgore, B. S., Meteorologist.

Mail for the Station should be addressed to the Director.

MISSOURI.

MISSOURI AGRICULTURAL EXPERIMENT STATION.

Department of Missouri Agricultural College.

J. W. Sanborn, B. S., Dean.

Location of Station, Columbia. Director, J. W. Sanborn, B. S.

GOVERNING BOARD.

The Curators of the University of Missouri.

Executive Committee of Board of Curators.

Rev. W. Pope Yeaman, LL. D., President, Columbia.

J. S. Moss, Columbia.

Hon. W. S. Pratt, Columbia.

Advisory Council.

His Excellency D. R. Frances, Governor of the State, Jefferson City.

Rev. W. Pope Yeaman, LL. D., President Board of Curators of the State University, Columbia.

Ava E. Page, Master of the State Grange, Appleton City.

———, President of the State Board of Agriculture.

J. C. Evans, President of the State Horticultural Society.

L. A. Goodman, Secretary of the State Horticultural Society, Westport.

J. W. Sanborn, B. S., Professor of Agriculture, Missouri Agricultural College, Columbia.

Paul Schweitzer, Professor of Chemistry.

Paul Paquin, M. D., V. S., State Veterinarian.

J. W. Clark, B. S., Professor of Horticulture and Entomology.

G. C. Broadhead, Professor of Geology.

STATION STAFF.

J. W. Sanborn, B. S., Director.

Paul Schweitzer, Ph. D., Chemist.

Gustave Gehring, A. M., Assistant Chemist.

———, Agriculturist.

J. W. Clark, B. S., Horticulturist and Entomologist.

Paul Paquin, M. D., V. S., Veterinarian.

John W. Connaway, M. D., Assistant in Veterinarian's Laboratory.

———, Assistant Horticulturist.

W. S. Wilson, Farm Superintendent.

S. C. Yeaman, Secretary.

R. B. Price, Treasurer.

Mail for the Station should be addressed to the Director.

NEBRASKA.

AGRICULTURAL EXPERIMENT STATION OF NEBRASKA.

Department of University of Nebraska.

Charles E. Bessey, Ph. D., Acting Chancellor.

Location of Station, Lincoln. Director, Charles E. Bessey, Ph. D.

GOVERNING BOARD.

Regents of the University.

Charles H. Gere, President, Lincoln.

John T. Mallalien, Kearney.

Milton J. Hull, Edgar.

Leavitt Burnham, Omaha.

Byron D. Davis, McCook.

George Roberts, Creighton.

Executive Committee.

Charles H. Gere, Lincoln.

Leavitt Burnham, Omaha.

Charles E. Bessey, Lincoln.

Visiting Committee.

Hon. R. W. Furnas, State Agricultural Society, Brownville.

W. R. Robertson, State Agricultural Society, Madison.

J. G. Carpenter, State Horticultural Society, Fairbury.

STATION STAFF.

Charles E. Bessey, Ph. D., Director and Botanist.

J. Stuart Dales, Treasurer.

Jared G. Smith, B. Sc., Assistant Agriculturist.

Hudson H. Nicholson, M. A., Chemist.

Dewitt B. Brace, Ph. D. Meteorologist.

Frank S. Billings, D. V. M., Investigator of Animal Diseases.

Lewis E. Hicks, Ph. D., Geologist.

Lawrence Bruner, Entomologist.

J. D. Courtney, Foreman of the Farm.

Mail for the Station should be addressed to the Director.

NEVADA.

NEVADA STATE AGRICULTURAL STATION.

Department of Nevada State University.

Le Roy D. Brown, Ph. D., President.

Location of Station, Reno. Director, Le Roy D. Brown, Ph. D.

GOVERNING BOARD.

Board of Control.

Hon. H. L. Fish, Reno.

Judge Thomas H. Wells, Carson City.

Hon. E. T. George, Lewis.

STATION STAFF.

Le Roy D. Brown, Ph. D., Director.
 Walter McNab Miller, B. Sc., Botanist, Chemist, and Weather Observer.
 Robert D. Jackson, Ph. D., Engineering.
 H. K. Clapp, A. M., Librarian.
 S. G. Kendall, Janitor.

Mail for the Station should be addressed to the director.

NEW HAMPSHIRE.

NEW HAMPSHIRE AGRICULTURAL EXPERIMENT STATION.

Department New Hampshire College of Agriculture and the Mechanic Arts.

Charles H. Pettee, C. E., Dean.

Location of Station, Hanover. Director, G. H. Whitcher, B. S.

GOVERNING BOARD.

Board of Control.

Hon. Warren Brown, President, Hampton Falls.
 S. B. Whittemore, Colebrook.
 Hon. G. A. Wason, Nashua.
 G. H. Whitcher, B. S., Secretary, Hanover.

STATION STAFF.

G. H. Whitcher, B. S., Director.
 A. H. Wood, B. S., Superintendent Dairy Department.
 H. H. Lamson, M. D., Microscopist and Assistant Botanist.
 F. A. Morse, B. S., Assistant Chemist.
 E. H. Farrington, M. S., Assistant Chemist.
 C. L. Parsons, B. L., Assistant Chemist.
 Charles H. Pettee, C. E., Meteorologist.
 J. M. Fuller, Farmer.
 H. L. Barnard, Clerk.

Mail for the Station should be addressed to the director.

NEW JERSEY.

NEW JERSEY STATE AGRICULTURAL EXPERIMENT STATION.

At Rutgers College.

Location of Station, New Brunswick. Director, George H. Cook, LL. D.

GOVERNING BOARD.

His Excellency Robert S. Green, Governor, Trenton.
 Merrill E. Gates, Ph. D., LL. D., President of Rutgers College, the State Agricultural College, New Brunswick.
 George H. Cook, LL. D., Vice President and Professor of Agriculture of the State Agricultural College, Secretary, New Brunswick.
 Hon. Thomas H. Dudley, First District, Camden.
 I. M. Smalley, First District, Roadstown.
 John I. Bishop, Second District, Columbus.

Ralph Ege, Second District, Hopewell.
 John V. N. Willis, Third District, Marlborough.
 James Neilson, Treasurer, Third District, New Brunswick.
 John DeMott, President, Fourth District, Middlebush.
 Caleb Wyckoff, Fourth District, Belvidere.
 Samuel P. De Marest, jr., Fifth District, Hackensack.
 Rev. Oliver Crane, M. D., D. D., Fifth District, Morristown.
 William R. Ward, Sixth District, Newark.
 William M. Force, Sixth District, Newark.
 Abram W. Duryee, Vice President, Seventh District, New Durham.
 James Stevens, Seventh District, Jersey City.

STATION STAFF.

George H. Cook, LL. D., Director.
 Edward S. Voorhees, A. M., Chemist.
 Henry R. Baldwin, jr., Chemist.
 Louis A. Voorhees, A. B., Chemist.
 Irving S. Upson, A. M., Clerk.
 David L. Scudder, Laboratory Attendant.

Mail for the Station should be addressed to the Director.

NEW JERSEY AGRICULTURAL COLLEGE EXPERIMENT STATION.

Department of Rutgers College.

Merrill Edwards Gates, Ph. D., LL. D., L. H. D., President.

Location of Station, New Brunswick. Director, George H. Cook, LL. D.

GOVERNING BOARD.

The Executive Committee upon the College Agricultural Experiment Station under the act of Congress of March 2, 1837 (Committee of Trustees of Rutgers College in New Jersey).

Merrill Edwards Gates, Ph. D., LL. D., L. H. D., President of College, Chairman, New Brunswick.

Hon. George C. Ludlow, Ex-Governor of New Jersey, New Brunswick.

Hon. Henry Bookstaver, LL. D., 14 East Sixty-seventh street, New York City.

Henry R. Baldwin, M. D., Chairman Committee on College Farm, New Brunswick.

James Neilson, City Treasurer of New Brunswick, New Brunswick.

STATION STAFF.

George H. Cook, Ph. D., LL. D., Professor of Geology and Agriculture, Director.

George D. Hulst, M. A., Editor "Entomologica Americana," Entomologist.

Horace B. Patton, Ph. D., Adjunct Professor of Chemical Geology and Mineralogy, Chemical Geologist, Investigator of Soils.

Julius Nelson, Ph. D., Professor of Biology, Biologist, Investigator of Food-Products of State.

Bryon D. Halsted, Sc. D., Professor of Botany and Horticulture, Horticulturist and Botanist.

Irving S. Upson, M. A., Disbursing Clerk and Librarian.

Mail for the Station should be addressed to the Director.

NEW YORK.

NEW YORK AGRICULTURAL EXPERIMENT STATION.

Location of Station, Geneva. Director, Peter Collier, Ph. D.

GOVERNING BOARD.

His Excellency David B. Hill, Albany.
 N. M. Curtis, President, Ogdensburg.
 W. A. Armstrong, Elmira.
 James McCann, Elmira.
 Daniel Batchelor, Utica.
 Patrick Barry, Rochester.
 W. W. Wright, Geneva.
 Charles Jones, Geneseo.
 G. S. Miller, Peterborough.
 George F. Mills, Fonda.

Executive Committee.

W. W. Wright, chairman, Geneva.
 James McCann, Elmira.
 Charles Jones, Geneseo.
 W. O'Hanlon, Secretary and Treasurer.

STATION STAFF.

Peter Collier, Ph. D., Director.
 William P. Wheeler, First Assistant.
 Emmett S. Goff, Horticulturist.
 E. F. Ladd, Chemist.
 Frank E. Emery, Superintendent of Farm.
 George W. Churchill, Farmer.
 Frank E. Newton, Stenographer.

Mail for the Station should be addressed to the Director.

CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION.

Department of Cornell University.

Charles K. Adams, LL. D., President.

Location of Station, Ithaca. Director, Isaac Phillips Roberts, M. Agr.

GOVERNING BOARD.

Board of Control.

The Trustees of the University.

Station Council.

Charles K. Adams, LL. D., President of the University.
 Hon. Andrew D. White, LL. D., L. H. D., Trustee of University.
 W. A. Wadsworth, President State Agricultural Society.
 Isaac Phillips Roberts, M. Agr., Professor of Agriculture.
 George C. Caldwell, B. S., Ph. D., Professor of Chemistry.
 James Law, F. R. C. V. S., Professor of Veterinary Science.
 Albert N. Prentiss, M. S., Professor of Botany.
 John H. Comstock, B. S., Professor of Entomology.
 Liberty H. Bailey, M. S., Professor of Horticulture.
 William R. Dudley, M. S., Assistant Professor of Cryptogamic Botany.

STATION STAFF.

Isaac Phillips Roberts, M. Agr., Director and Professor of Agriculture.
 Henry Hiram Wing, B. Agr., Deputy Director and Secretary.
 E. L. Williams, Treasurer.
 George C. Caldwell, B. S., Ph. D., Chemist.
 James Law, F. R. C. V. S., Veterinarian.
 Albert N. Prentiss, M. S., Botanist and Arboriculturist.
 John H. Comstock, B. S., Entomologist.
 Liberty H. Bailey, M. S., Horticulturist.
 William R. Dudley, M. S., Cryptogamic Botanist.
 James Meddick Drew, Assistant in Agriculture.
 William Parker Cutter, B. S., Assistant in Chemistry.
 ———, Assistant in Veterinary Science.
 John Moore Stedman, B. S., Assistant in Entomology.
 Wilton Marks Munson, B. S., Assistant in Horticulture.

Mail for the Station should be addressed to the Director.

NORTH CAROLINA.

NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION.

Location of Station, Raleigh. Director, H. B. Battle, Ph. D.

GOVERNING BOARD.

State Board of Agriculture.

His Excellency Alfred M. Scales, Governor of the State, *ex officio*, Chairman.
 W. R. Williams, Master State Grange, Patrons of Husbandry, Falkland.
 R. W. Wharton, First District, Washington.
 A. G. Brooks, M. D., Second District, Black Creek.
 H. L. Grant, Third District, Goldsborough.
 W. F. Green, Fourth District, Franklinton.
 J. S. Murrow, Fifth District, Centre.
 S. B. Alexander, Sixth District, Charlotte.
 A. Leazar, Seventh District, Mooresville.
 Burwell Blanton, Eighth District, Shelby.
 C. D. Smith, D. D., Ninth District, Franklin.

STATION STAFF.

H. B. Battle, Ph. D., Director and Chemist.
 J. R. Chamberlain, B. S., Agriculturist.
 F. B. Dancy, A. B., Assistant Chemist.
 F. B. Carpenter, B. S., Assistant Chemist.
 B. Thorp, B. S., Assistant Chemist.
 J. R. Harris, Assistant Chemist.
 Gerald McCarthy, B. Sc., Botanist.
 H. McP. Baldwin, U. S. Signal Corps, Meteorologist.
 R. T. Burwell, Ph. B., Secretary.

Mail for the Station should be addressed to the Director.

18087—Bull. 1—4

OHIO,

OHIO AGRICULTURAL EXPERIMENT STATION.

Location of Station, Columbus. Director, Charles E. Thorne.

GOVERNING BOARD.

Board of Control.

Governor Joseph B. Foraker, *ex officio*, Columbus.
 Seth H. Ellis, President, Springborough.
 Joseph H. Brigham, Treasurer, Delta.
 J. L. McIlvaine, New Philadelphia.
 Charles E. Thorne, *ex officio*, Columbus.
 William R. Lazenby, Secretary, Columbus.

STATION STAFF.

Charles E. Thorne, Director.
 William J. Green, Vice Director and Horticulturist.
 J. Fremont Hickman, M. A. S., Agriculturist.
 W. S. Devol, B. Ag., Botanist and Bursar.
 Clarence M. Weed, M. Sc., Entomologist.
 H. J. Detmers, M. V. D., Veterinarian.
 Moses Craig, Meteorologist.

Mail for the Station should be addressed to the Director.

OREGON.

OREGON EXPERIMENT STATION.

Department of Oregon State Agricultural College.

B. L. Arnold, A. M., President.

Location of Station, Corvallis. Director, E. Grimm, B. Sc.

GOVERNING BOARD.

Board of Regents of the State Agricultural College.

W. S. Ladd, President, Portland.
 T. E. Cauthorn, Treasurer, Corvallis.
 Wallis Nash, Secretary, Corvallis.
 His Excellency Sylvester Pennoyer, Governor, Salem.
 G. W. McBride, Secretary of State, Salem.
 E. B. McElroy, Superintendent Public Instruction, Salem.
 H. E. Hayes, Master State Grange, Oswego.
 J. T. Apperson, Oregon City.
 J. W. Grim, Aurora.
 John Emmett, Umpqua Ferry.
 J. H. Kunzie, Umatilla.
 W. P. Keady, Portland.
 J. K. Weatherford, Albany.

STATION STAFF.

Station Council.

E. Grimm, B. Sc., Director and Agriculturist.
 F. H. Irish, Ph. D., Chemist.
 E. R. Lake, M. S., Botanist and Horticulturist.

Mail for the Station should be addressed to the Director.

PENNSYLVANIA.

THE PENNSYLVANIA STATE COLLEGE AGRICULTURAL EXPERIMENT STATION.

Department of the Pennsylvania State College.

George W. Atherton, LL.D., President.

Location of Station, State College, Centre Co. Director, H. P. Armsby, Ph. D.

GOVERNING BOARD.

His Excellency James A. Beaver, Governor of Pennsylvania, Harrisburg.

Hon. Charles W. Stone, Secretary of Commonwealth, Harrisburg.

George W. Atherton, LL.D., President of College, Secretary State College.

John McDowell, President State Agricultural Society, Washington.

Hon. Thomas J. Stewart, Secretary Internal Affairs, Harrisburg.

General Daniel H. Hastings, Adjutant-General, Harrisburg.

E. E. Higbee, D. D., Superintendent Public Instruction, Harrisburg.

Joseph M. Wilson, President Franklin Institute, Philadelphia.

Hon. Francis Jordan, President of the Board, Harrisburg.

John Hamilton, Treasurer, Lemont.

Elected members.

Charles W. Roberts, West Chester.

James P. Doyle, Philadelphia.

Gabriel Hiester, Harrisburg.

Frank Knoche, Harrisburg.

Hon. George W. Hood, Indiana.

Andrew Carnegie, Pittsburgh.

H. V. White, Bloomsburgh.

Joel A. Herr, Cedar Springs.

Cyrus Gordon, Clearfield.

Hon. John H. Orvis, Bellefonte.

Hon. Amos H. Mylin, Lancaster.

Hon. John A. Woodward, Howard.

Samuel R. Downing, West Chester.

STATION STAFF.

George W. Atherton, LL.D., President of the College.

H. P. Armsby, Ph. D., Director.

William Frear, Ph. D., Vice Director and Chemist.

William A. Buckhout, M. S., Botanist.

George C. Butz, M. S., Horticulturist.

William C. Patterson, Superintendent of Farm.

William H. Caldwell, B. S., Assistant Agriculturist.

George L. Holter, B. S., Assistant Chemist.

W. L. Sweetser, B. S., Assistant Chemist.

———, Gardener.

Miss Julia C. Gray, Clerk and Stenographer.

Mail for the Station should be addressed to the Director.

RHODE ISLAND.

RHODE ISLAND STATE AGRICULTURAL EXPERIMENT STATION.

Department of Rhode Island State Agricultural School.

Charles O. Flagg, B. S., President Board of Managers.

Location of Station, Kingston. Director *pro tem.*, Charles O. Flagg, B. S.

GOVERNING BOARD.

Board of Managers Rhode Island State Agricultural School.

Charles O. Flagg, B. S., President, Abbott Run.

Hon. Charles J. Green, Kenyon.

Hon. Melville Bull, B. A., Secretary and Treasurer, Newport.

C. A. Shippee of W., Exeter Hill.

Hon. C. H. Coggeshall, Bristol.

STATION STAFF.

Charles O. Flagg, B. S., Director.

L. F. Kinney, B. S., Horticulturist.

Mail for the Station should be addressed to the Director.

SOUTH CAROLINA.

SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION.

Department of the University of South Carolina.

John M. McBryde, Ph. D., LL. D., President.

Location of Station, Columbia. Director, John M. McBryde, Ph. D., LL. D.

GOVERNING BOARD.

*Board of Trustees.**Members ex officio.*His excellency J. P. Richardson, Governor, *ex-officio* President of the Board, Columbia.

Hon. W. D. Simpson, Chief Justice of the Supreme Court, Columbia.

Hon. Henry McIver, Associate Justice of the Supreme Court, Cheraw.

Hon. Samuel McGowan, Associate Justice of the Supreme Court, Abbeville.

Hon. J. H. Rice, State Superintendent of Education, Ninety-Six.

Hon. G. L. Buist, Chairman Senate Committee on Education, Charleston.

Hon. C. J. C. Hutson, Chairman House of Representatives Committee on Education, Yemassee.

J. B. Humbert, President of the State Agricultural and Mechanical Society, Princeton.

W. K. Thompson, Master of the State Grange of the Patrons of Husbandry, Liberty Hill.

Members State Board of Agriculture.

General Johnson Hagood, Barnwell.

D. P. Duncan, Union.

I. Stoney Porcher, Eutawville.

Hon. John Lawton, Lawtonville.

Hon. James McCutchen, Church.

Hon. H. L. Buck, Buckport.

Hon. W. A. Ancrum, Boykin.

R. A. Love, Chester.

Hon. T. J. Moore, Moore.

Hon. B. F. Crayton, Anderson.

Members elected.

Hon. J. F. Izlar, Orangeburgh.
 John Bratton, White Oak.
 Hon. A. C. Haskell, Columbia.
 Hon. W. C. Coker, Darlington.
 Dr. Robert Henry, Gourdin's.
 Hon. W. H. Brawley, Charleston.
 Hon. E. B. Murray, Anderson.
 I. H. Means, Secretary of the Board.

Special committee of Board of Trustees.

John Lawton, chairman, Lawtonville.
 B. E. Crayton, Anderson.
 R. A. Love, Chester.
 W. A. Ancrum, Boykin.
 J. T. Moore, Moore.

STATION STAFF.

J. M. McBryde, Ph. D., Director.
 Milton Whitney, Vice Director.
 W. B. Burney, Ph. D. (State chemist), Chemist.
 J. B. McBryde, A. B., C. E., First Assistant Chemist.
 R. J. Davidson, A. M., Second Assistant Chemist.
 R. H. Loughridge, Ph. D., Analyst of Soils, Seeds, etc.
 B. M. Bolton, M. D., Bacteriologist and Microscopist.
 G. F. Atkinson, Ph. B., Botanist and Entomologist.
 W. B. Niles, D. V. M., Veterinarian.
 H. H. Huggins, Secretary.
 J. W. Wofford, Superintendent Spartanburgh Farm.
 S. I. Gaillard, Superintendent Columbia Farm.
 J. D. McCall, Superintendent Darlington Farm.

Mail for the Station should be addressed to the Director.

TENNESSEE.

TENNESSEE AGRICULTURAL EXPERIMENT STATION.

Department of the University of Tennessee.

Charles W. Dabney, jr., Ph. D., President.

Location of Station Knoxville. Director, Charles W. Dabney, jr., Ph. D.

GOVERNING BOARD.

Board of Trustees.

His excellency Robert L. Taylor, Governor of Tennessee, *ex officio*.
 Hon. John Allison, Secretary of State, *ex officio*.
 Hon. Frank M. Smith, Superintendent of Public Instruction, *ex officio*.
 Hugh L. McClung, Knoxville.
 Hon. O. P. Temple, Knoxville.
 Frank A. R. Scott, Knoxville.
 Robert H. Armstrong, Knoxville.
 S. H. Smith, M. D., Secretary, Knoxville.
 R. P. Eaton, Eaton's Cross Roads.

H. L. W. Mynatt, House Mountain.
 Hon. D. A. Nunn, Brownsville.
 Edward J. Sanford, Knoxville.
 W. A. Henderson, Knoxville.
 Hon J. M. Coulter, Trenton.
 Rev. James Park, D. D., Knoxville.
 James Comfort, Knoxville.
 James D. Cowan, Knoxville.
 C. Deaderick, M. D., Knoxville.
 John M. Boyd, M. D., Knoxville.
 Hon. George Brown, Knoxville.
 J. W. Gaut, Knoxville.
 Samuel J. McKinney, Knoxville.
 William Morrow, M. D., Nashville.
 William B. Reese, Nashville.
 Moses White, Knoxville.
 Samuel B. Luttrell, Knoxville.
 Robert Craighead, Treasurer, Knoxville.
 Dr. Charles W. Dabney, jr., Ph. D., President of the Board.

Board of Control.

O. P. Temple, Knoxville.
 James Park, D. D., Knoxville.
 J. W. Gaut, Knoxville.
 Robert Craighead, Knoxville.
 R. H. Armstrong, Knoxville.

STATION STAFF.

Charles W. Dabney, jr., Ph. D., Director.
 Charles S. Plumb, B. S., Assistant Director.
 F. Lamson Scribner, B. S., Botanist and Horticulturist.
 Winthrop E. Stone, B. S., Ph. D., Chemist.
 Henry E. Summers, B. S., Entomologist.
 Clifford Lewis Newman, B. S., General Assistant.
 Robert J. Cummings, Foreman of Experimental Farm.

Mail for the Station should be addressed to the Director. The Station requests that of bulletins and reports two copies be addressed to the Station, two to the Director, one to the College Library, and one to each member of the Station Staff.

TEXAS.

TEXAS AGRICULTURAL EXPERIMENT STATION.

Department of Agricultural and Mechanical College of Texas.

L. L. McInnis, M. A., Chairman of Faculty.

Location of Station, College Station. Director, F. A. Gulley, M. Sc.

GOVERNING BOARD.

Board of Directors of Agricultural and Mechanical College of Texas.

C. C. Garrett, President, Brenham.
 Hon. L. L. Foster, State Commissioner of Agriculture, Austin.
 W. R. Cavitt, Bryan.
 George M. Dilley, Palestine.
 A. J. Rose, Salado.
 L. L. McInnis, M. A., Secretary, College Station.

Experiment Station Council.

L. L. McInnis, M. A., Chairman of Faculty.
 T. M. Scott, Agent of the Board.
 F. A. Gulley, M. Sc., Director of the Station.

STATION STAFF.

F. A. Gulley, M. Sc., Director.
 G. W. Curtis, M. A. S., Agriculturist.
 H. H. Harrington, M. Sc., Chemist.
 T. L. Brunk, B. Sc., Horticulturist.
 J. H. Kinealy, D. E., Meteorologist.
 M. Francis, D. V. M., Veterinarian.
 W. Wipprecht, B. S. A., Assistant Chemist.
 J. H. Carson, Assistant to Director.
 D. Adriance, Assistant to Chemist.
 J. F. Duggar, M. Sc., Assistant to Agriculturist.
 J. F. McKay, B. S., Assistant to Horticulturist.

Mail for the Station should be addressed to the Director.

VERMONT.

VERMONT STATE AGRICULTURAL EXPERIMENT STATION.

Department of University of Vermont.

Matthew Henry Buckham, D. D., President.

Location of Station, Burlington. Director, W. W. Cooke, M. A.

GOVERNING BOARD.

Board of Control.

Matthew Henry Buckham, D. D., President of the University of Vermont, *ex-officio*,
 Burlington.

Hon. E. J. Ormsbee, Secretary, Brandon

Hon. Crosby Miller, Pomfret.

H. O. Wheeler, Treasurer.

STATION STAFF.

Officers of the Station.

W. W. Cooke, M. A., Director.
 G. H. Perkins, Ph. D., Entomologist.
 C. W. Minott, B. Agr., Horticulturist.
 J. L. Hills, B. Agr., Chemist.
 B. O. White, B. Ph., Assistant Chemist.
 N. E. Wilson, Superintendent Dairying.
 J. A. Chapin, Farmer.
 Jessie Lawrence, Stenographer.

Mail for the Station should be addressed to the Director.

VIRGINIA

VIRGINIA AGRICULTURAL EXPERIMENT STATION.

Department of Virginia Agricultural and Mechanical College.

L. L. Lomax, President.

Location of Station, Blacksburg. Director, William Ballard Preston.

GOVERNING BOARD.

Board of Visitors of the Virginia Agricultural and Mechanical College.

Hon. J. H. Tyler, Rector, Belle Hampton.

J. L. Buchanan, LL. D., Superintendent Public Instruction, Richmond.

Hon. W. R. Staples, Richmond.

C. E. Vawter, President Miller Manual Labor School, Crozet.

J. D. H. Ross, Lexington.

A. D. Payne, Warrenton.

Hon. N. S. Turnbull, Lawrenceville.

John W. Lawson, M. D., Smithfield.

Joseph M. Barton, Winchester.

Executive Committee.

Hon. J. H. Tyler, Belle Hampton.

John L. Buchanan, LL. D., Richmond.

C. E. Vawter, Crozet.

STATION STAFF.

Station Council.

William B. Preston, Director.

William B. Alwood, Vice Director, Botanist, and Entomologist.

Walker Bowman, Ph. D., Chemist.

D. O. Nourse, B. S., Agriculturist.

Judge John Gardner, Treasurer.

Mail for the Station should be addressed to the Director.

WEST VIRGINIA.

WEST VIRGINIA EXPERIMENT STATION.

Department of West Virginia University.

E. M. Turner, LL. D., President.

Location of Station, Morgantown. Director, John A. Myers, A. M.

GOVERNING BOARD.

Board of Regents.

J. B. Sommerville, Wellsburgh.

Clarence L. Smith, Fairmont.

Peregrin Hays, Glenville.

D. D. Johnson, Long Reach.

John G. Schilling, Spencer.

Edward A. Bennett, Huntington.

Wirt A. French, Princeton.

M. J. Kester, Union.

D. C. Gallaher, Charleston.

Thomas J. Farnsworth, Buckhannon.

Joseph Moreland, Morgantown.

John A. Robinson, President, Patterson's Creek.

W. W. Brown, Kabletown.

John I. Harvey, Treasurer of Board of Regents.

W. P. Willey, Secretary of Board of Regents.

STATION STAFF.

John A. Myers, A. M., Director and Chemist.
 A. C. Magruder, B. S., Dairyman.
 A. R. Whitehill, A. M., Meteorologist and Assistant Chemist.
 J. W. Hartigan, M. D., Microscopist.
 William B. Doan, M. D., Ornithologist.

Mail for the Station should be addressed to the Director.

WISCONSIN.

AGRICULTURAL EXPERIMENT STATION OF THE UNIVERSITY OF WISCONSIN.

Department of University of Wisconsin.

T. C. Chamberlain, LL. D., President.

Location of Station, Madison. Director, W. A. Henry, B. Agr.

GOVERNING BOARD.

Board of Regents.

The State Superintendent of Instruction, *ex officio*.
 Hon. George H. Paul, State at large, President.
 Hon. E. W. Keyes, State at large, Chairman Executive Committee.
 Hon. J. G. McMynn, First District, Madison.
 Hon. Henry D. Hitt, Second District, Oakland.
 Hon. George Raymer, Third District, Madison.
 Hon. George Koepen, Fourth District, Milwaukee.
 Hon. Hiram Smith, Fifth District, Sheboygan Falls.
 Hon. Frank Challoner, Sixth District, Omro.
 Hon. C. H. Williams, Seventh District, Baraboo.
 Hon. William P. Bartlett, Eighth District, Eau Claire.
 Hon. R. D. Marshall, Ninth District, Chippewa Falls.
 E. F. Riley, Secretary, Madison.

Station Committee.

Hon. Hiram Smith, Sheboygan Falls.
 Hon. Henry D. Hitt, Oakfield.
 Hon. C. H. Williams, Baraboo.

STATION STAFF.

T. C. Chamberlin, LL. D., President.
 W. H. Henry, B. Agr., Director.
 S. M. Babcock, Ph. D., Chief Chemist.
 F. H. King, Physicist.
 F. G. Short, First Assistant Chemist.
 F. M. A. Woll, M. S., Second Assistant Chemist.
 Leslie H. Adams, Farm Superintendent.
 Miss N. M. Nott, Clerk and Stenographer.

Mail for the Station should be addressed to the Director.

UNITED STATES LEGISLATION REGARDING EXPERIMENT STATIONS.

Frequent calls for the acts of Congress relating to the Experiment Stations, as well as their historic interest, lead to the insertion of the following :

REPORT OF THE COMMITTEE ON AGRICULTURE OF THE HOUSE OF REPRESENTATIVES,
MARCH 3, 1886.

[House Report No. 818, Forty-ninth Congress, first session.]

The Committee on Agriculture, to whom was referred the bill (H. R. 2933) to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July 2, 1862, and of the acts supplementary thereto, having had the same under consideration, submit the following report :

The object of the bill is to aid agriculture by the establishment of what are known in Europe and the United States as experiment stations. The Agricultural Department was established, among other things, "to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture, in the most general sense of that word, and to procure, propagate, and distribute among the people new and valuable seeds and plants." Experiments in the Agricultural Department at Washington are reliable only for such portions of the country as present the same conditions of temperature, moisture, soil, etc. A large proportion of seeds and plants tested at Washington fail in other portions of the country where the conditions are different. Agriculture is so variable in the different States that it is impracticable for one station to cover the field of needed investigation. The cotton and rice States have their climate, their peculiar crops, their insect enemies, and their special problems. The great prairie States have their peculiar wants and difficulties, and so of the several sections. Experiments that are at all reliable can only be performed in the several localities and under their varying conditions.

The amount of annual appropriations for the Agricultural Department are not sufficient to justify the commission to employ agents who possess the necessary scientific acquirements, and who can devote sufficient time to make accurate reports. The result has been that voluntary lay correspondents have been employed, without compensation, whose reports of crop prospects, soils, etc., have often been inaccurate and conflicting. The experiment stations provided for in this bill, would furnish scientific data on all matters contemplated in the bill, and would enable the Department to disseminate reliable and valuable information.

When we consider the vast area of our country it will not be seriously contended that one such station in each State would be too many. In some of the larger States two could be maintained with profit. In such case it is provided that the amount appropriated to the State be equally divided unless the legislature of the State shall provide otherwise. It is believed that this discretion would be proper, and that the public sentiment of the State would be sufficient to prevent its abuse.

It is becoming apparent from year to year that the United States have not the undisputed monopoly as the producers of cereals. For many years, owing to the newness and richness of our soils, we had a decided advantage over our competitors, much

of which was due to advantages in transportation as well as ease and cheapness of production, and we held the markets of Southern Europe and Great Britain. Of late years Russia has become a large producer and exporter of wheat, while Australia and India are rapidly developing as wheat producing and exporting countries. The same is true of meat and other agricultural products. While this competition is sharp, and becoming more so as transportation facilities are afforded our competitors, it would seem that every encouragement consistent with economy derived from science and experiment should be given in aid of this great industry. The object should be to increase production at a decreased cost, and at the same time to preserve the fertility of our soils.

But the committee deem it unnecessary to enlarge upon the importance of the end to be attained. No principle is better established among civilized nations than that the prosperity of agriculture involves that of every other interest. No conviction is stronger or more universal among our own people than that it is the duty of the Government, by every legitimate means in its power, to aid in preserving and developing the agricultural resources of the country, thereby promoting the welfare not only of those who make this branch of industry the business of their lives, but that of every other class of citizens.

Equally beyond question, in the judgment of the committee, are the wisdom and effectiveness of the means proposed by this bill to accomplish the desired results. Upon this point we need not resort to conjecture. We can appeal to what has already been done, here and elsewhere, as the surest indication of what may reasonably be expected in the future. Experiment stations have been in operation in Europe upwards of thirty years, not including in this statement the establishment of Sir John Bennett Lawes, of Rothamstead, England, who has spent much of his life and a large part of his princely fortune in experimenting in agriculture for the benefit of mankind. His experiment station was fully organized in 1843, with Dr. Gilbert, one of the first agricultural chemists in Europe, at its head, and has probably done more work of permanent importance than any similar station in the world. Mr. Lawes has made arrangements in his will for carrying on the station he has so nobly established after his death, by giving sufficient land and donating near a half million of dollars in money. The first experiment station after that of Mr. Lawes (under that title, "Versuchs-Station") was established at Moeckern, Saxony, in 1852. Since that time only two years have passed without witnessing the establishment of from one to twenty of such stations, until at the end of the year 1884 there had been 143 established on the continent of Europe—81 in the various States of Germany and 67 in other countries. About a dozen of these have either been discontinued or, as in several cases has happened, been merged in some other organization. The rest continue in successful operation. They have created processes and produced results which are everywhere accepted as introducing a new era in agricultural advancement. It would not be possible, within moderate limits, to give any full detail of these results; but the lines they have followed, and the extent of the field covered, may be indicated by a few summary statements. Sixteen stations, for example, are principally devoted to soil investigations; 23, to investigations in modes of cultivation and fertilization; 13, to questions connected with viticulture and the manufacture of wine; 3, to horticulture; 1, to olive culture; 9, to silviculture; 2, to methods of cultivating moor, swamp, and waste lands; 23, to researches in plant physiology; 11, to diseases of plants; 21, to investigations in animal physiology, feeding, digestion, etc.; 11, to dairy investigations; 6, to the scientific points in silk culture; 3, to the sugar industry; 2, to alcohol manufacture, the chemistry of fermentation, etc.; 2, to beer manufacture; 22, to technical researches in agricultural chemistry; and 5, to questions respecting some minor agricultural industries.

All the foregoing lines of investigation are pursued from the scientific standpoint, and with reference to scientific rather than directly practical results; but many of the stations are employed in practical work for immediate ends. Fifty-four, for example,

are occupied in the work of fertilizer control ; 43, in seed control ; and 38, in feeding stuff control. These subjects of inquiry are subdivided into various special branches, which it is not necessary to enumerate. They will readily suggest themselves. Another highly interesting and important result from the establishment of these stations is the remarkable activity that they have stimulated in agricultural writings. More than 2,000 books and pamphlets were published by experiment stations between the years 1852 and 1877. Of these, 66 treated of the original sources of plant food ; 103, of soils, including soil formation, physical and chemical properties of soils, soil analysis, and soil improvement ; 484, of plant physiology, including plant nutrition in general, mineral and other foods, the mutual action of root and soil, the mutual action of stem and leaves with the atmosphere, the circulation of material within the plant, the genesis, metamorphosis, and character of organic plant products. Under this head also were treated the action of physical agents upon plants ; the phenomena of plant development, as germination, development of organs, production of material, reproduction ; the diseases and malformations of cultivated plants, including injuries from parasites, fungi, and animals. Ninety-eight works treated of the chemical composition of plants ; 217, of fertilization, with the analysis of natural and artificial manures ; 229, of field experiments, including the action of fertilizers and researches respecting the effect of cultivation and fertilization on different kinds of plants ; 594 works were devoted to a consideration of the numerous questions respecting the production of farm animals, such as the constituents and secretions of the animal body, the composition of feeding stuffs and nutrients, the preparation and preservation of foods, the digestibility and the assimilation of foods, the chemical changes involved in animal growth, the effect of external condition, diseases of domestic animals, and many others ; 359 works treated of special topics in agricultural technology and of analytical methods.

This bare enumeration presents a striking picture of the activity of the experiment stations and of the immense impulse they have given to agricultural research. Combining, as they do, the precision of scientific methods with an intelligent regard to the requirements of practical operations, it is not surprising that they have come to be looked upon, wherever established, as the most important aids to successful farming, as well as the foremost agency for the advancement of agricultural science. They have taught the most profitable methods of cultivation and fertilization with different soils and crops, and the best ways of doing the thousand minor operations of daily work ; have driven out of the market inferior fertilizers, food-stuffs, and seeds, thereby saving millions of dollars to the farming community ; and, by raising the productiveness of agricultural industry, have to that extent helped to solve one of the standing problems of society—how to relieve the pressure of population upon subsistence.

Agricultural experiments are not a new thing. They are as old as the tillage of the soil. Until recently the existing state of agriculture was almost exclusively a result of centuries of crude experimentation. But it is only since the theories of Liebig were organized into working institutions (the experiment stations) that experiments have been so conducted as to furnish a helpful and authoritative rule of practice. A scientific experiment is made, not for the purpose of seeking or sustaining a theory, but of learning a fact. It must be conducted, as far as possible, under ascertained and controllable conditions ; and, where that is not possible, intelligent allowance for the variation must be made and stated. Each step must be accurately observed and verified, and this process must be repeated, under identical conditions, times enough to eliminate every form of error. The logical process is like that in support of a legal proposition. The ground must be cleared and the foundation laid. Each advance in the argument must rest securely on that which precedes. No link in the chain must be omitted. The appropriate evidence must be marshaled in support of each point. The irresistible conclusion follows. Compared with such a process, the ordinary field experiment is as the bungling of an apprentice to the finished work of the trained artisan.

The work being done by European stations is equally needed in the United States, and is already begun in obedience to an imperative public demand. The decay of agriculture in the older States, the deterioration of soils in the first-settled group of new States, the rapid absorption of public lands, and the increasing competition of Russia and India in the food-markets of the world, have strongly arrested public attention. The conviction has become general that waste must be checked and productiveness increased. The growth of intelligent interest in this and similar subjects among the agricultural community within a few years past is one of the most striking and hopeful signs of the time. The increase of knowledge on the scientific questions involved in farming and the growing demand for trustworthy information are altogether unprecedented, and every effort to supply the demand seems only to stimulate rather than to satisfy it. Agricultural societies, boards of agriculture, and other organizations have long given important aid in this direction, but the agency which has proved so beneficial abroad has within the last ten years received a remarkable impulse in our own country, and few who have not given the matter special attention can have more than an imperfect idea of the extent to which efforts in this direction have been begun within the period named.

The first "experiment station" under that specific designation in the United States was established at Middletown, Conn., in 1875, by the joint action of Mr. Orange Judd, the trustees of the university at Middletown, and the State legislature, with Prof. W. O. Atwater as director. In 1877 the station was taken under the more direct control of the State and removed to New Haven, where it has since been in successful operation. In the same year, 1877, the example of Connecticut was followed by North Carolina; in 1880, by New Jersey; and in 1881, by New York. Of these four experiment stations that in Connecticut, as already stated, and the one in North Carolina were first established in connection with colleges, but afterwards removed. The New York station has from the first been a separate establishment. The New Jersey station was established, and has since continued, in connection with the State Agricultural College at New Brunswick. Since 1881 the legislatures of several States have either recognized or reorganized the departments of agriculture in the land-grant colleges as "experiment stations," thus following substantially the course adopted by New Jersey. Such stations have been established in Maine, Massachusetts, Ohio, Tennessee, and Wisconsin. In three other States (possibly more), without legislative action, the college authorities have organized their agricultural work as experiment stations. This has been done in California, Missouri, and New York. But in addition to the twelve experiment stations specifically designated by that name a very large number of the colleges established under the act of 1862 are doing important work of a precisely similar kind. Many of them began such work immediately upon their establishment and have since maintained it continuously; others have entered upon it more recently. The colleges in Colorado, Indiana, Kansas, Michigan, and Pennsylvania are carrying on what is strictly experiment station-work as a part of their ordinary duty. Next in importance to the results obtained through these varied and wide-spread activities is the effort generally made to bring them directly within reach of those actually engaged in farm-work. This is done by means of the newspaper press, by annual or biennial reports, and especially by slips, folders, and bulletins, which are scattered broadcast, disseminating information, stimulating thought, teaching how best to coin work into wealth. As illustrating the range of the work that some of these colleges and stations are doing, the following summary statement is given, naming a few of the subjects that have recently occupied their attention:

Alabama (State station, located at college):

- (1) Fertilizer control.
- (2) Development of Alabama phosphates.
- (3) Fish culture.
- (4) Field experiments on cotton, wheat, and corn.
- (5) Insects injurious to cotton.

Connecticut (State station, independent):

- (1) This station is chiefly devoted to fertilizer control, analyzing 115 to 175 samples yearly; has added much of value to knowledge of the fertilizing value of natural manures, and of manufacturing wastes, and of composting.
- (2) Next in importance are its analyses of feeding-stuffs, which number 25 to 50 yearly, including many new commercial articles, and also studies of values of hay and maize at different stages in growth and curing and from different species and varieties.
- (3) Third in importance are the feeding experiments, mainly on milking cows; these have added much to the knowledge of American foods and of the milk of different breeds.
- (4) Studies of the relation of evaporation and percolation to various soils.
- (5) Seed tests, testing purity and vitality of various samples and effect of age on different species.
- (6) Improvement of chemical methods applied to agricultural investigation; soda-lime method of nitrogen determination; improvement in apparatus for absolute nitrogen determination; studies of different methods of determining albuminoids, arsenies, phosphoric acid, etc.; forms of apparatus for seed tests, etc.
- (7) Studies on the composition of leaves and of tobacco leaf and stalk.
- (8) Investigation on soils, rocks, and waters.
- (9) Poisoning cases.
- (10) Studies on stringy milk, peach yellows, potato scab, and skin crack, and strawberry blight.
- (11) Studies on antiseptics used for dairy purposes.

Massachusetts (State station, connected with college):

- (1) Fertilizer control.
- (2) Fodder analyses.
- (3) Drainage experiments.
- (4) Feeding experiments with milch cows and pigs.
- (5) Observations on milk.
- (6) Injurious insects.
- (7) Fruit culture experiments.
- (8) Peach yellows.
- (9) Drinking-water analyses.
- (10) Meteorology.
- (11) Seed tests.

New Jersey (State station, connected with college):

- (1) Fertilizer control.
- (2) Feeding experiments with dairy cows.
- (3) Field experiments with various fertilizers.
- (4) Sorghum sugar manufacture.
- (5) Ensilage, its composition and feeding value.
- (6) Financial studies of the dairy business.
- (7) Chemical composition of diseased plants, cranberries, and sweet potatoes, with experimental treatment.
- (8) Fodder analyses.

North Carolina (State station, independent):

- (1) Fertilizer control (chemical and field tests).
- (2) Development and analyses of North Carolina phosphates, marls, and limestones.
- (3) Studies of home sources of nitrogen and potash (North Carolina).
- (4) Analyses of soils, rocks, and ores for State geologist.
- (5) Analyses of waters, drugs, and foods, poisons, for Board of Health.
- (6) Field tests on silicated fertilizers, North Carolina superphosphates.

North Carolina (State station, independent)—Continued.

- (7) Notes on composting.
- (8) Study of cultures in North Carolina, and chemical composition of sugar beet, cotton, jute, soja bean.
- (9) Manufacturing relations of rice and cotton seed industries.
- (10) Seed tests.
- (11) Study of special fertilizer ingredients as affecting North Carolina soils and crops.
- (12) Feeding stuffs and ensilage.

Ohio (State station, connected with college):

- (1) Wheat experiments, including comparative tests of varieties; cross-fertilization and selection; thick and thin seeding; winter protection and spring cultivation; early and late plowing and sowing; application of fertilizers; methods of seeding.
- (2) Corn experiments, including comparison of varieties; planting at different depths; thick and thin seeding; methods of culture; application of fertilizers.
- (3) Experiments in pig-feeding.
- (4) Other experiments, including small fruits; oats; garden vegetables; injurious insects; weeds—methods by which weeds are disseminated and propagated—habit of growth and duration of life—the best methods of destruction (at least twelve kinds examined); grasses; forest trees; seed tests; meteorological record; sorghum; chemical researches.

Pennsylvania (college experiments):

- (1) Effects of various fertilizers on the growth of wheat, corn, oats, and grass, including comparative effect of single ingredients; effect of complete as compared with partial fertilizers; comparative effect of different forms of nitrogen; necessary artificial supply of nitrogen; comparative effect of commercial fertilizers and yard manure; effect of lime, ground limestone, and plaster; permanency of effect of the different fertilizers; effect of the various fertilizers upon the comparative growth of the crops; effect of the various fertilizers upon the relation of grain and straw; the necessary error involved in field experimentation; yield of wheat sown at different depths and with different quantities of seed; experiments with different forms of phosphoric acid; experiments with field plots; experiments with boxes.
- (2) Examination of agricultural seeds.
- (3) Ensilage, including cultivation of the crop; preservation of fodder by ensilage; character and appearance of the ensilage; results of feeding ensilage; method of taking samples; amount and kind of loss that occurs; effect of loose and gradual filling of the silo; changes that occur in the nitrogen compounds of ensilage.
- (4) Descriptive notes on trees, shrubs, and vines on college grounds.
- (5) Effect of cutting timothy and clover grasses at different stages of growth.
- (6) Feeding experiments.
- (7) Sorghum.
- (8) Cattle food analyses.
- (9) Effect of different fertilizers upon the composition of the ash of tobacco.
- (10) The feeding value of soft corn.
- (11) Nitrogen determinations.

Tennessee (State station, connected with college):

- (1) Wheat culture, including amount of seed and product per acre, with comparative results for four years; varieties and produce; modes of seeding; time of cultivating; tests with barn-yard manures; tests with commercial fertilizers; tests with chemical fertilizers.
- (2) Oat culture.
- (3) Corn culture.

Tennessee (State station, connected with college)—Continued.

- (4) Ensilage.
- (5) Forage and silage crops, including sorghum; teosinte (tropical, resembling pearl millet); millo maize; durra; upland rice; Johnson grass; soja hispida (Japan pea); clover; grass.
- (6) Other experiments, including cotton, Irish potato, fruits, flowers, garden vegetables, stock and stock-feeding, tests of commercial fertilizers.

Wisconsin (State station, connected with college):

- (1) Feeding experiments on milch cows, calves, sheep and pigs, with digestion experiments.
- (2) Study of fungoid disease of plants.
- (3) Observations on the time of appearance and falling of leaves of trees, vines, etc.
- (4) Experiments in methods of manufacturing milk products.
- (5) Field experiments with varieties of wheat, oats, barley, and sorghum.
- (6) Fodder analyses.
- (7) Meteorology.
- (8) Machine trials.
- (9) Fertilizer control.

The above are only specimen lists, and might be greatly extended. They give but a bare hint of the number and variety of questions, scientific and practical, which continually present themselves to the farmer or investigator, or both. Nor is it alone in connection with old facts and theories that such questions arise. Every modification of conditions, soil, climate, treatment, cross-fertilization in plants, cross-breeding in animals, creates new problems for the solution of which past experience or knowledge is often entirely inadequate. It is this situation that the land-grant colleges have tried to meet in the way above indicated. That the results produced, while of the greatest value, have been far from satisfactory to themselves and far from meeting the pressing requirements of public need, is freely admitted. But it should be borne in mind that experiment work is only an incidental part of their proper vocation. Their leading function is, in the words of the law of 1862, "to teach branches of learning." If the work of the institutions related exclusively to agriculture, or could be so restricted in honest compliance with the provisions of the law, experiment work would be legitimate so far as it found a method of teaching, but could scarcely be extended so as to cover the broad field of practical life. But their work can not be restricted to agriculture. Under the law they must also teach "the branches of learning related to the mechanic arts" and are not to exclude "other scientific and classical studies." What they have done, therefore, in experimenting and publishing for practical, as distinguished from educational, ends, has been done in recognition of a deeply-felt public need, and only by diverting to this use resources which were already inadequate for their strictly educational work.

Congress is now asked to undertake, on the broadest grounds of public policy and of enlightened care for the national well-being, the work so urgently needed but so imperfectly provided for. The benefits that would be conferred upon the country by the passage of this bill are immeasurable. They are limited by no State or sectional lines. The bill proposes to utilize the buildings, laboratories, farms, libraries, and apparatus belonging to the institutions which Congress has already established, and thus to supplement, for a specific end, the appliances already created for general ends. The provisions made for conducting the work, with careful restrictions upon waste of funds, the methods provided for collating and publishing results, and for co-operation among the stations, all tend to give the proposed operations a character of breadth, permanence, and general usefulness which could not so well (if at all) be secured in any other way.

It should be observed also that this bill is not open to the objection of entering upon any new or untried field of Congressional legislation. It only proposes to give a practical direction to agencies which Congress has already created.

The act appropriating scrip to the amount of 30,000 acres for each Senator and Representative in Congress for the endowment of colleges for the benefit of agriculture and the mechanic arts, which was passed in 1852, has been fruitful. Some of the States endowed single colleges while others divided the gift between two or three. There were 17,430,000 acres of scrip and land granted, and the fund arising from their sales is \$7,545,405. This has been increased by gifts from the States and from benevolent individuals of grounds, buildings, and apparatus to the amount of \$5,000,000 more. And the last reports show that these colleges employed more than 400 professors, and had under instruction more than 4,000 students. This donation of the public funds has been eminently profitable for the Government and the country. Many thousands of young men educated in science have already gone out from their colleges to engage in the practical duties of life, and the provision is made for sending out a continued succession of these for all future time. And as science is not limited by State boundaries, it makes but little difference for the common good which of these institutions or States these graduates come from; their attainments are for the common good. The bill under consideration proposes to increase the efficiency of these colleges in their relations to agriculture exclusively.

The appropriation sought is \$15,000 a year for each State, or \$570,000 in all the States. This is a small sum to appropriate for the special improvement of an industry which requires the labor of 7,500,000 men and gives direct support to one-half of our population; which has invested in its lands \$10,000,000,000, in its implements and machinery \$400,000,000, in its live stock \$1,500,000,000, and in its products an annual value of \$2,200,000,000. It makes but little difference whether an experiment station is located in Delaware or in Texas; its work is in scientific investigation and its applications to practice. The results of the work done as contemplated by this bill are at once published and communicated to all the others and to the Department here at Washington, so that the work is national. To have so many stations occupied in investigating the questions which interest all agriculturists must produce results which can not be reached by single institutions or by divided efforts. A discovery by one of these will be accepted and welcomed by all, and will lend new incentives to a generous and active rivalry in all, at the same time that each may have some subjects of special interest in its own State.

For the foregoing reasons, and many others which might be named, your committee report back the bill (H. R. 2933) with amendments, and recommend the passage of the amended bill.

[Forty-ninth Congress, Second Session, Chapter 314. Statutes of the United States, vol. 24, page 440.]

AN ACT to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July second, eighteen hundred and sixty-two, and of the acts supplementary thereto.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science, there shall be established, under direction of the college or colleges or agricultural department of colleges in each State or Territory established, or which may hereafter be established, in accordance with the provisions of an act approved July second, eighteen hundred and sixty-two, entitled "An act donating public lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts," or any of the supplements to said act, a department to be known and designated as an "agricultural experiment station:" *Provided,* That in any State or Territory in which two such colleges have been or may be so established the appropriation hereinafter made

to such State or Territory shall be equally divided between such colleges, unless the legislature of such State or Territory shall otherwise direct.

SEC. 2. That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth; the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and value of grasses and forage plants; the composition and digestibility of the different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States or Territories.

SEC. 3. That in order to secure, as far as practicable, uniformity of methods and results in the work of said stations, it shall be the duty of the United States Commissioner of Agriculture to furnish forms, as far as practicable, for the tabulation of results of investigation or experiments; to indicate, from time to time, such lines of inquiry as to him shall seem most important; and, in general, to furnish such advice and assistance as will best promote the purposes of this act. It shall be the duty of each of said stations annually, on or before the first day of February, to make to the governor of the State or Territory in which it is located a full and detailed report of its operations, including a statement of receipts and expenditures, a copy of which report shall be sent to each of said stations, to the said Commissioner of Agriculture, and to the Secretary of the Treasury of the United States.

SEC. 4. That bulletins or reports of progress shall be published at said stations at least once in three months, one copy of which shall be sent to each newspaper in the States or Territories in which they are respectively located, and to such individuals actually engaged in farming as may request the same, and as far as the means of the station will permit. Such bulletins or reports and the annual reports of said stations shall be transmitted in the mails of the United States free of charge for postage, under such regulations as the Postmaster-General may from time to time prescribe.

SEC. 5. That for the purpose of paying the necessary expenses of conducting investigations and experiments and printing and distributing the results as hereinbefore described, the sum of fifteen thousand dollars per annum is hereby appropriated to each State, to be specially provided for by Congress in the appropriations from year to year, and to each Territory entitled under the provisions of section eight of this act, out of any money in the Treasury proceeding from the sales of public lands, to be paid in equal quarterly payments, on the first day of January, April, July, and October in each year, to the treasurer or other officer duly appointed by the governing boards of said colleges to receive the same, the first payment to be made on the first day of October, eighteen hundred and eighty-seven: *Provided, however*, That out of the first annual appropriation so received by any station an amount not exceeding one-fifth may be expended in the erection, enlargement, or repair of a building or buildings necessary for carrying on the work of such station; and thereafter an amount not exceeding five per centum of such annual appropriation may be so expended.

SEC. 6. That whenever it shall appear to the Secretary of the Treasury from the annual statement of receipts and expenditures of any of said stations that a portion of the preceding annual appropriation remains unexpended, such amount shall be deducted from the next succeeding annual appropriation to such station, in order that the amount of money appropriated to any station shall not exceed the amount actually and necessarily required for its maintenance and support.

SEC. 7. That nothing in this act shall be construed to impair or modify the legal relation existing between any of the said colleges and the government of the States or Territories in which they are respectively located.

SEC. 8. That in States having colleges entitled under this section to the benefits of this act and having also agricultural experiment stations established by law separate from said colleges, such States shall be authorized to apply such benefits to experiments at stations so established by such States; and in case any State shall have established under the provisions of said act of July second aforesaid, an agricultural department or experimental station, in connection with any university, college, or institution not distinctively an agricultural college or school, and such State shall have established or shall hereafter establish a separate agricultural college or school, which shall have connected therewith an experimental farm or station, the legislature of such State may apply in whole or in part the appropriation by this act made, to such separate agricultural college or school, and no legislature shall by contract express or implied disable itself from so doing.

SEC. 9. That the grants of moneys authorized by this act are made subject to the legislative assent of the several States and Territories to the purposes of said grants: *Provided*, That payment of such instalments of the appropriation herein made as shall become due to any State before the adjournment of the regular session of its legislature meeting next after the passage of this act shall be made upon the assent of the governor thereof duly certified to the Secretary of the Treasury.

SEC. 10. Nothing in this act shall be held or construed as binding the United States to continue any payment from the Treasury to any or all the States or institutions mentioned in this act, but Congress may at any time amend, suspend, or repeal any or all the provisions of this act.

Approved, March 2, 1887.

[Fiftieth Congress, First Session, Chapter 5, Statutes of the United States, vol. 25, page 32.]

AN ACT making an appropriation to carry into effect the provisions of an act approved March second, eighteen hundred and eighty-seven, entitled "An act to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July second, eighteen hundred and sixty-two, and of acts supplementary thereto."

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That to carry into effect the provisions of an act approved March second, eighteen hundred and eighty-seven, entitled "An act to establish agricultural experiment stations in connection with the colleges established in the several States, under the provisions of an act approved July second, eighteen hundred and sixty-two, and of the acts supplementary thereto", the sum of five hundred and eighty-five thousand dollars, or so much thereof as may be necessary, is hereby appropriated, out of any money in the Treasury not otherwise appropriated, for the fiscal year ending June thirtieth, eighteen hundred and eighty-eight.

Approved, February 1, 1888.

[Fiftieth Congress, First Session. Statutes of the United States, vol. 25, page 176.]

CHAP. 373.—AN ACT to amend an act entitled "An act to establish agricultural stations in connection with the colleges established in the several States under the provisions of an act approved July second, eighteen hundred and sixty-two, and of the acts supplementary thereto."

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the grant of money authorized by the act of Congress entitled "An act to establish agricultural experiment stations in connection with the colleges established in the several States under the provisions of an act approved July second, eighteen hundred and sixty-two, and of acts supplementary thereto," are

subject, as therein provided, to the legislative assent of the States or Territories to be affected thereby; but as to such installments of the appropriations as may be now due or may hereafter become due when the legislature may not be in session, the governor of said State or Territory may make the assent therein provided, and, upon a duly certified copy thereof to the Secretary of the Treasury, he shall cause the same to be paid in the manner provided in the act of which this is amendatory until the termination of the next regular session of the legislature of such State or Territory.

Approved June 7, 1888.

[Fiftieth Congress, First Session. Statutes of the United States, vol. 25, page 334.]

CHAP. 677 (last paragraph).

EXPERIMENTAL STATIONS.

That to carry into effect the provisions of an act approved March second, eighteen hundred and eighty-seven, entitled "An act to establish agricultural experiment stations in connection with the colleges established in the several States, under the provisions of an act approved July second, eighteen hundred and sixty-two, and of the acts supplementary thereto," five hundred and ninety-five thousand dollars; ten thousand dollars of which sum shall be payable upon the order of the Commissioner of Agriculture to enable him to carry out the provisions of section three of said act of March second, eighteen hundred and eighty-seven, and to compare, edit, and publish such of the results of the experiments made under section two of said act by said experimental stations as he may deem necessary; and for these purposes the Commissioner of Agriculture is authorized to employ such assistants, clerks, and other persons as he may deem necessary.

Approved July 18, 1888.

The following, from the act making an appropriation for the Department of Agriculture for the fiscal year ending June thirtieth, eighteen hundred and ninety, and for other purposes, is inserted as this bulletin is going through the press:

[Fiftieth Congress, Second Session.]

PUBLIC—No. 116 (last paragraph).

EXPERIMENTAL STATIONS.

That to carry into effect the provisions of an act approved March second, eighteen hundred and eighty-seven, entitled "An act to establish agricultural experiment stations in connection with the colleges established in the several States, under the provisions of an act approved July second, eighteen hundred and sixty-two, and of the acts supplementary thereto," six hundred thousand dollars, fifteen thousand dollars of which sum shall be payable upon the order of the Secretary of Agriculture to enable him to carry out the provisions of section three of said act of March second, eighteen hundred and eighty-seven, and to compare, edit, and publish such of the results of the experiments made under section two of said act by said experimental stations as he may deem necessary; and for these purposes the Secretary of Agriculture is authorized to employ such assistants, clerks, and other persons as he may deem necessary: *Provided*, That, as far as practicable, all such stations shall devote a portion of their work to the examination and classification of the soils of their respective States and Territories, with a view to securing more extended knowledge and better development of their agricultural capabilities.

Approved March 2, 1889.

RULINGS OF THE TREASURY DEPARTMENT AS TO THE CONSTRUCTION OF THE ACT OF CONGRESS OF MARCH 2, 1887, ESTABLISHING AGRICULTURAL EXPERIMENT STATIONS.

From copies of letters addressed to the Secretary of the Treasury, and others by the First Comptroller of the Treasury, relating to the construction of the act of Congress of March 2, 1887, and acts supplementary thereto, the following digest has been prepared for the use of the stations. The sections are those of the act, the dates, those of the decisions by the Comptroller :

Section 3. January 30, 1888.

That the annual financial statement of the stations, with vouchers, should not be sent to the Treasury Department, but that a copy simply of the report that is made to the governor is to be sent to the Secretary of the Treasury.

Section 3. January 31, 1888.

First. That the Treasury Department will not require officers of experiment stations to do or perform anything not specifically required by said bill.

Second. That the Secretary of the Treasury is not required to take a bond of the officers of said stations for the money paid over under the provisions of said act.

Third. That no reports will be required from the stations directly to the Secretary of the Treasury ; but the governor of the State must send to the Secretary of the Treasury a copy of the report made to him by the colleges or stations.

Section 5. March 4, 1887.

“Congress only intended by the expression ‘the sum of fifteen thousand dollars is hereby appropriated to each State,’ to fix the amount that could be specially provided for by Congress in appropriations from year to year. Hence I conclude that section 5 does not make an appropriation ; but that the same must be specially provided for by Congress.”

Sections 5 and 6. March 10, 1888.

(1) The appropriations are intended for the fiscal year and not the calendar year.

(2) The first annual report should be made on or before the 1st day of February, 1889, and said report should include simply the operations of the preceding fiscal year, not down to and including December 31, but up to and including June 30, 1888.

(3) The balance unexpended at the end of the fiscal year, the 30th of June preceding the report, must be accounted for in the report.

(4) The one-fifth proviso for building in section 5 can be made out of the first annual appropriation, to wit, that which commences on the 1st day of July, 1887, and terminates on the 30th of June, 1888.

(5) The intention of Congress was to make quarterly payments, not in advance, but at the end of each quarter.

Section 5, proviso. March 22, 1888.

"I have been informed that there is no farm connected with the agricultural college in Delaware. The act provides that one-fifth of the amount appropriated can be expended in the creation, enlargement, or repair of a building or buildings for carrying on the work of the station receiving the appropriation. I am in doubt whether, with this qualification, out of the balance of the appropriation a farm could either be purchased or rented. Another question in my mind is as to the competency of the legislature which was in session at the date of the passage of the act to accept, as it assumed to do, of the provisions of the act, the ninth section of which provides that 'Payment of such installments of the appropriation herein made as shall become due to any State before the adjournment of the regular session of its legislature meeting next after the passage of this act shall be made upon the assent of the governor thereof duly certified to the Secretary of the Treasury.'"

Section 6. April 24, 1888.

At the end of the present fiscal year, to wit, June 30, any portion of the \$15,000 which shall have been received, up to and including the payment made on the 1st day of July, which is unexpended, or which may not be necessary to pay claims under contracts made for the benefit of said agricultural station, must be deducted from the next annual appropriation, as specified in said sixth section.

Section 6. August 2, 1888.

The fiscal year commences on the 1st day of July, corresponding with the fiscal year of the Government.

An agricultural station entitled to the benefits of said appropriations made by Congress can anticipate the payment to be made July 1, and make contracts of purchases prior to that time, if it shall be necessary to carry on the work of the station. Of course no portion of said appropriations paid in quarterly installments can be drawn from the Treasury unless needed for the purposes indicated in the act; and so much of what is so drawn as may not have been expended within the year must be accounted for as part of the appropriation for the following year.

Section 8. January 30, 1888.

The State of New York ought to designate whether to the college or to the station, or to both, it desires the appropriation to be applied. The eighth section of the act seems to authorize the State to apply such benefits to experimental stations it may have established as it desires.

Where there are no experimental stations connected with the colleges, the legislatures of such States must connect the agricultural experiment stations with the colleges already established under the act of July 2, 1862; there is no authority in the act authorizing the establishment of agricultural experiment stations independent of said colleges.

The act contemplates that where stations have already been established disconnected from the colleges, the legislatures of such States may take such provisions in regard thereto as they may deem proper; but it does not authorize the establishment of stations except in connection with the colleges that were at that time or might thereafter be established under the act of July 2, 1862.

Section 8. February 14, 1888.

Where there is an agricultural college or station which may have been established by State authority, and is maintained by the State, the eighth section of the above act would authorize the State to designate the station to which it desired the appro-

priation to be applied, whether to one or more, or all, and the Secretary of the Treasury should make the payment under the appropriation to whichever one the State might designate.

Sections 1 and 8. February 15, 1888.

(1) When an agricultural college or station has been established under the act of July 2, 1862, each college is entitled to the benefits of the provisions of said act (*i. e.*, of March 2, 1887).

(2) In a State where an agricultural college has been established under the act of July 2, 1862, and agricultural stations have also been established, either under the act of July 2, 1862, or by State authority, before March 2, 1887, the legislature of such State may determine which one of said institutions, or how many of them, shall receive the benefits of the act of March 2, 1887.

(3) If the legislature of any State in which an agricultural college has been established under the act of July 2, 1862, desires to establish an agricultural station which shall be entitled to the benefits of said act it must establish such station in connection with said college.

Proviso to section 1 and section 8. December 7, 1888.

It is within the power of the legislature of any State that has accepted the provisions of said act of March 2, 1887, to dispose of the amount appropriated by Congress for said station to either one or all of the agricultural colleges or stations which may have been established in said State by virtue of either the provisions of the act of July 2, 1862, or the provisions of said eighth section of the act of March 2, 1887.

The whole responsibility rests upon the State legislature as to how the fund appropriated by Congress shall be distributed among these various institutions of the State, provided there is one or more agricultural colleges with which an agricultural station is connected, or one or more agricultural stations.

Section 8. January 23, 1889.

The act of the State of Georgia in authorizing the governor to receive the fund to which the State may be entitled under the act of March 2, 1887, is not in conflict with any of the provisions of said act. If a State has established an agricultural college or station under the act of July 2, 1862, or if it has established an agricultural station in connection with said college, as provided in the eighth section of March 2, 1887, the legislature can authorize some person or persons to receive the money donated by the Government and direct its application in such way and manner as it seems best to carry out the objects and purposes of said acts of Congress to either the colleges or the station, or to both.

Section 9. February 4, 1888.

It appears by the statement of Representative Blount that there was a session of the legislature of the State of Georgia after the passage of the act, and before the first payment became due, October 1, 1887, and which did not adjourn until after that time. That being the case, under the proviso of the section, the governor of the State can not assent to that payment which was to be made October 1, 1887. The legislature having adjourned before the second payment became due, without accepting the provisions of the bill, no further payment can be made to said State until the legislature thereof shall have accepted the provisions of the bill. You will observe, the language of the proviso, "that payments of the installments of the appropriation herein made as shall become due to any State before the adjournment of the regular session of its legislature" applies, certainly, only to such installments as become due before the final adjournment. The idea seems to be to give the legislature the full time before it adjourns to accept the provisions of the bill or not; but it is plain to my mind, that only such payments as become due before the adjournment of the legislature can be accepted by the governor of the State.

REGULATIONS OF THE POST-OFFICE DEPARTMENT FOR THE FREE TRANSMISSION IN THE MAILS OF THE BULLETINS AND REPORTS OF AGRICULTURAL EXPERIMENT STATIONS UNDER THE ACT OF CONGRESS OF MARCH 2, 1887.

[As amended January 27, 1888.]

(1) Any claimant of the privilege must apply for authority to exercise it to the Postmaster-General, stating the date of the establishment of such station, its proper name or designation, its official organization and the names of its officers, the name of the university, college, school, or institution to which it is attached, if any, the legislation of the State or Territory providing for its establishment, and any other granting it the benefits of the provision made by Congress as aforesaid (accompanied by a copy of the act or acts), and whether any other such station in the same State or Territory is considered, or claims to be, also entitled to the privilege; and also the place of its location and the name of the post-office where the bulletins and reports will be mailed. The application must be signed by the officer in charge of the station.

(2) If such application be allowed after examination by the Department, the postmaster of the proper office will be instructed to admit such bulletins and reports to the mails in compliance with these regulations, and the officer in charge of the station will be notified thereof.

(3) Only such bulletins and reports as shall have been issued after the station became entitled to the benefits of the act can be so transmitted free; and they must be enclosed in unsealed envelopes, or so wrapped as to admit of easy and thorough examination. On the exterior of the envelope or wrapper must be written or printed the name of the station and the place of its location, the designation of the enclosed bulletin or report, and the word "free" over the signature of the officer in charge of the station, to be written by himself or by some one duly deputed by him for that purpose. If any other matter, printed or written, be added, the whole will be un-mailable free.

(4) The bulletins may be mailed to the stations, newspapers, or persons to whom they are by the foregoing act authorized to be sent, and the annual reports to any address within the United States.

A BRIEF ACCOUNT OF THE EXPERIMENT STATION MOVEMENT IN THE UNITED STATES.

BY A. C. TRUE, PH. D.

In the United States, as in Europe, the first organized experimental work in agricultural science was done in connection with the higher educational institutions.

It is claimed that Yale College was the first American institution to officially recognize the claims of agricultural science. In 1846 John P. Norton was appointed professor of agricultural chemistry and vegetable and animal physiology. Professor Norton began his lectures in 1847, and during the five years which intervened before his death he also wrote extensively for agricultural journals, edited an American edition of "Stevens on the Farm," and published a work of his own, entitled "Elements of Agriculture." After the fund which had been established by the sale of the land-scrip donated to Connecticut under the act of Congress of July 2, 1862, had been given to the Sheffield Scientific School of Yale College in 1863, a professor of agriculture was added to the working force of that institution. Samuel W. Johnson, M. A., the successor of Professor Norton as professor of theoretical and agricultural chemistry, and William H. Brewer, Ph. D., the professor of agriculture, have for many years taken an active interest in all work for the promotion of agricultural science in Connecticut and elsewhere in the United States. Under their direction experimental work for the benefit of agriculture was carried on to a limited extent at New Haven more than twenty years ago, and it is doubtless safe to say that "through the influence of the professors and pupils trained in this school, more than to any other single cause, is due the recognition of the importance of the establishment of agricultural experiment stations, first in Connecticut, and subsequently throughout the whole country."

In 1870 the president and fellows of Harvard College began to organize the school of agriculture and horticulture which had been provided for in the will of Mr. Benjamin Bussey, of Roxbury, Mass. This interesting document was signed July 30, 1835, and was proved soon after the death of the testator in 1842. It bequeathed half of the income of about \$300,000 and 200 acres of land in Roxbury to the President and Fellows of Harvard College, on condition that they establish

on the farm "a course of instruction in practical agriculture, in useful and ornamental gardening, in botany, and in such other branches of natural science as may tend to promote a knowledge of practical agriculture and the various arts subservient thereto." Owing to other provisions of the will, it was not deemed advisable to begin the formation of the Bussey Institution earlier than 1870. In the same year, the trustees of the Massachusetts Society for Promoting Agriculture granted to the corporation of Harvard College a considerable sum "for the support of a laboratory and for experiments in agricultural chemistry, to be conducted on the Bussey estate." The laboratory of the new institution was not ready for occupation until the last week in 1871. As soon as it was completed, however, agricultural researches were begun by F. H. Storer, the professor of agricultural chemistry, and his assistants. The first report of this work was presented to a committee of the trustees of the Massachusetts Society for Promoting Agriculture, December 3, 1871. The experiments consisted of field tests of fertilizers upon the farm of the institution, and chemical analyses of commercial fertilizers. Other interesting and valuable work was done in the next few years, but the great fire in Boston in 1872, and the commercial crisis of 1873, combined to cripple the institution financially, and it has since been able to make comparatively few original investigations. Meanwhile, agricultural colleges had been organized in a number of the States. Michigan led the way in 1857, and New York soon followed her example. After the passage of the land grant act in 1862, Kansas and Massachusetts were the first States to avail themselves of the national gift by establishing agricultural colleges, and thereafter the formation of these institutions proceeded with as much rapidity as could have been expected when the country was recovering from the direful effects of the civil war. Experimental work in agriculture was undertaken in several of these institutions soon after their organization.

The reports of the successful and beneficial work done in the European experiment stations excited more and more attention on this side of the Atlantic, and the more advanced leaders in agricultural progress in this country began to ask for the establishment of similar institutions in the United States. In 1872, at a convention of representatives of agricultural colleges held in Washington in response to a call issued by the United States Commissioner of Agriculture, the question of the establishment of experiment stations was discussed, and the report of a committee in favor of such institutions was adopted by the convention. On the 17th of December, 1873, at the winter meeting of the State Board of Agriculture, at Meriden, Conn., Professor Johnson, of the Sheffield Scientific School, and Professor Atwater, of Wesleyan University, urged the establishment of an agricultural experiment station in that State after the European pattern. A committee was appointed to consider the expediency of such a movement, and reported two days later that it was "their unanimous opinion that the State of Connecti-

cut ought to have an experiment station as good as can be found anywhere, and that the legislature of the State ought to furnish the means for its establishment." A permanent committee was then appointed by the board to bring this matter to the attention of the public and the legislature. This committee held meetings in different parts of the State, and the following winter secured the introduction of a bill for an experiment station, which, however, was laid over until the next session of the legislature. Another year of agitation of the matter ensued. The project had many warm and enthusiastic friends, but, as might have been expected, the great mass of the farmers took little interest in the enterprise. When it had become apparent that it could not succeed Mr. Orange Judd, the editor and proprietor of the *American Agriculturist*, offered on his own part \$1,000 to begin the undertaking, and on the part of the trustees of Wesleyan University at Middletown the free use of the chemical laboratory in the Orange Judd Hall of Natural Science.

These offers were made on condition that the legislature should appropriate \$2,800 per annum for two years for the work of the station. It was thought that if by these means the work of agricultural experimentation could actually be begun the usefulness of the enterprise would be so clearly demonstrated that it would speedily receive more generous and permanent support. An act making the appropriation thus proposed was unanimously passed, and approved July 2, 1875. Early in October of the same year a chemist was on the ground, and, as soon as practicable, two assistants were secured. Professor Atwater was made director, and thus the first agricultural experiment station in America was an accomplished fact. Notwithstanding the severe financial depression of 1877, which caused serious reduction in old appropriations and utter refusal of new ones by the legislature of that year, a bill prepared by the director of the station and making a permanent annual appropriation of \$5,000 "to promote agriculture by scientific investigation and experiment" was passed unanimously. At the end of the two years provided for in the original bill the station was reorganized under the direct control of the State, and permanently located in New Haven, where it has since been in successful operation, until 1882 in the chemical laboratory of the Sheffield Scientific School, and thereafter in buildings and on grounds provided by the State in the suburbs of the city.

The success which attended this first attempt to establish an organized experiment station in the United States was sufficient to attract the attention of advanced agriculturists throughout the country, and the example set by Connecticut was soon followed in other States. In 1876, the University of California, at Berkeley, begun systematic experimental work in agriculture, and March 12, 1877, the State of North Carolina established a station at Chapel Hill in connection with the State University. The Cornell University experiment station was organized in February, 1879, by the faculty of agriculture of the University, as a voluntary organization. From that time until the passage

of the act of Congress of March 2, 1887, the work was carried on by the different professors in time which could be spared from other studies. For a part of that time the trustees of the University appropriated money from the University funds to pay for the services of an analyst and for the purchase of supplies. All the other work was done without compensation. The New Jersey State station at New Brunswick, N. J., was established March 18, 1880, by an act of the State legislature and connected with the scientific school of Rutgers College. The movement grew in favor with the people with each succeeding year, and in 1886 the Committee on Agriculture, in reporting the Hatch bill to the House, was able to make the following statements:

Since 1881 the legislatures of several States have either recognized or reorganized the departments of agriculture in the land-grant colleges as "experiment stations," thus following substantially the course adopted by New Jersey. Such stations have been established in Maine, Massachusetts, Ohio, Tennessee, Wisconsin. In three other States (possibly more), without legislative action, the college authorities have organized their agricultural work as experiment stations. This has been done in California, Missouri, and New York. But in addition to the twelve experiment stations specifically designated by that name, a very large number of the colleges established under the act of 1862 are doing important work of a precisely similar kind. Many of them began such work immediately upon their establishment, and have since maintained it continuously; others have entered upon it more recently. The colleges in Colorado, Indiana, Kansas, Michigan, and Pennsylvania are carrying on what is strictly experiment station work as a part of their ordinary duty.

The convention of delegates of agricultural colleges which met at Washington in 1883 discussed and indorsed the project for the establishment of stations in connection with the colleges by appropriations from the National Treasury, in accordance with the terms of a bill already introduced in the House of Representatives by C. C. Carpenter, of Iowa. Congress, however, was not yet quite ready to undertake so large a scientific enterprise in this direction, and the bill was not put upon its passage. Meanwhile, the number of stations was steadily increasing, and the interest of practical farmers, as well as men of science, was more and more excited by the reports of the results of the experiments which the stations had completed. On the 8th of July, 1885, a convention of agricultural colleges and experiment stations met at the Department of Agriculture, at Washington, in response to a call issued by the Commissioner of Agriculture. Almost the first thing which this convention did was to pass a resolution, "That the condition and progress of American agriculture require national aid for the investigation and experimentation in the several States and Territories; and that, therefore, this convention approves the principle and general provisions of what is known as the Cullen bill of the last Congress, and urges upon the next Congress the passage of this or a similar act." (The Cullen bill was in its general provisions similar to the bill afterwards passed by Congress and now popularly known as the Hatch act.) So earnest was the convention in this matter that it appointed a committee on legislation, which was very efficient in securing the passage of the amended bill.

In a later session the convention passed resolutions urging the creation of a branch of the Department of Agriculture at Washington, which should be a special medium of intercommunication and exchange between the colleges and stations, and which should publish a periodical bulletin of agricultural progress, containing in a popular form the latest results in the progress of agricultural education, investigation, and experimentation in this and in all countries. Provision was also made for a permanent organization by the appointment of a committee to co-operate with the United States Commissioner of Agriculture in determining the time of meeting and the business of the next convention and in forming a plan for a permanent organization.

At the next session of Congress the experiment station enterprise was again called to the attention of the House of Representatives by the bill which was introduced by William H. Hatch, of Missouri, and referred to the Committee on Agriculture. This committee made a favorable report March 3, 1886, and nearly a year later the bill was passed by Congress and approved by President Cleveland, March 2, 1887.

On the 18th of October, 1887, the second convention of agricultural colleges and experiment stations convened at Washington. A permanent organization was effected, and the association was named "The Association of American Agricultural Colleges and Experiment Stations." George W. Atherton, LL. D., President of the Pennsylvania State College, was elected president of the association. This convention was deeply interested in securing the co-ordination of the work of the several stations and indorsed the action of previous conventions in urging the establishment of a central bureau. As the result of the efforts of this association, acting in harmony with the Commissioner of Agriculture, an appropriation for the purpose was included in the annual appropriation bill for the Department of Agriculture for the fiscal year ending June 30, 1889. To carry out the provisions of this bill the Commissioner of Agriculture, as has been already stated in this bulletin, instituted in October, 1888, an Office of Experiment Stations as a special branch of the Department of Agriculture.

In accordance with official interpretation of this act by the Treasury Department, the stations were unable to draw the money contemplated until after the passage of a supplementary act, which was approved February 1, 1888. This financial difficulty delayed the establishment of the stations in many of the States. At the present time, however, experiment stations are organized in all the States and in the Territory of Dakota. In several States more than one station has been organized, and in some States there are several branch stations under one management. Counting these latter as single stations, the total number at present is forty-six, but counting the branch stations separately the total number is about sixty.

The total number of the officers of the stations is about three hundred and seventy. For the fiscal year ending June 30, 1889, \$585,000 are

appropriated from the United States Treasury to the stations, and \$10,000 to the office of experiment stations at Washington. In addition, the stations receive from the States and from other sources (as far as can be ascertained at this time) \$125,400.

A complete report of the financial condition of the stations would undoubtedly increase this amount by several thousand dollars, so that it is safe to say that the total amount which will be expended by the stations during the current year will reach \$725,000.

Most of the new stations are in actual operation. Bulletins have been published giving accounts of their organization and of experimental and other work. The investigations cover a wide range of topics, and the stations have in nearly all cases manifested their wisdom by directing their investigations towards the solution of questions of special interest to the localities in which they are situated, without neglecting subjects of more general interest and wider application.

The experiment station enterprise is now equipped for its great work. From its beginning, fourteen years ago, in the laboratory of a Connecticut College, it has grown out to the farthest limits of our great land, has enlisted the best colleges and universities and the ablest investigators of the country, and secured both State and national resources for its service. It has the favor not only of leading minds in science and education but also of a great army of practical farmers, to whom it has already brought substantial benefits. As the Secretary of Agriculture has justly said, "Of all the scientific enterprises which the Government has undertaken, scarcely any other has impressed its value upon the people and their representatives in the State and national legislatures so speedily and so strongly as this. The rapid growth of an enterprise for elevating agriculture by the aid of science, its espousal by the United States Government, its development to its present dimensions in the short period of fourteen years, and, finally, the favor with which it is received by the public at large, are a striking illustration of the appreciation on the part of the American people of the wisdom and the usefulness of calling the highest science to the aid of the arts and industries of life.

"The present is an auspicious time for this undertaking. 'In the history of no nation before have there been such a thirst for knowledge on the part of the great masses of the people, such high and just appreciation of its value, and such wide-reaching, successful and popular schemes for self-education; no other nation has so large a body of farmers of high intelligence, never before has the great agricultural public been so willing and indeed so anxious to receive with respect and use with intelligence the information which science offers; never before has science had so much to give.' The prospects then for this, the largest scientific enterprise in behalf of agriculture that any government has undertaken, are full of promise."

INDEX.

A.

	Page
Agricultural Colleges and Experiment Stations, Association of American.....	8, 15, 16, 19, 77
Experiment Stations, account of movement to establish, in the United States.....	73-78
appropriations for	66, 67, 68
bulletins of	66
chronological table of organization of.....	20, 21
date of organization of first German.....	5, 59
first in America	61, 64, 66
in Europe.....	5, 59
legislation regarding.....	52-63
list of, with governing boards and station staffs.....	28-57
number of, in United States.....	6, 76, 77
officers of	6, 22, 23, 77
rapid growth of.....	6, 73
reasons for national aid to	64
report regarding, by Committee on Agriculture, House of Representatives	53-65
reports to be made by.....	8, 66
revenues of.....	6, 22, 23, 78
work of.....	61, 64, 66
Schools and Colleges in the United States, conventions of	74, 76, 77
dates of organization of.....	24-27
endowments of and number of students in	65
experimental work by	61, 73
list of	24-27
locations of.....	24-27
organization of.....	74
presidents of.....	24-27
science and education, history of progress of	15
Agriculture, Massachusetts Society for Promoting	74
Secretary of.....	5, 10, 11, 73
U. S. Commissioner of	13, 74, 76, 77
U. S. Department of, appropriations for	7, 65, 68
ways in which it may aid experiment stations.....	8, 9
Alabama Agricultural and Mechanical College.....	24
Experiment Stations, organization list of.....	23, 29
work of.....	61
Arkansas Experiment Station, organization list of.....	29, 30
Industrial University.....	24
substations	29, 30
Atherton, George W	77
Atwater, W. O	11, 61, 74, 75

B.

Brewer, William H.....	73
Bulletins, contemplated by Office of Experiment Stations.....	16
Experiment Station, of Office of Experiment Stations.....	16
farmers', of Office of Experiment Stations.....	16
quarterly, must be published by experiment stations	66
Bussey, Benjamin.....	73
Institution. organization and work of	74

C.

	Page.
California, College of Agriculture of University of.....	24
Experiment Station, organization list of.....	30, 31
General Culture Stations.....	31
Grape-Culture Stations.....	31
Outlying Stations.....	31
University of.....	75
Carpenter, C. C.....	76
Cleveland, Grover.....	77
Colleges, Agricultural, list of.....	24-27
Colman, Norman J.....	10, 11
Colorado Experiment Station, organization list of.....	31
State Agricultural College.....	24
Commissioner of Agriculture.....	13, 74, 76, 77
Connecticut Experiment Stations, organization lists of.....	32, 33
work of.....	62
Sheffield Scientific School of Yale University.....	24, 73, 75
Storr's Agricultural School.....	24
Co-operative field experiments.....	15
work by horticulturists.....	15
Cornell University.....	75
Cullen bill, for establishment of experiment stations.....	76

D.

Dakota Agricultural College.....	24
Experiment Station, organization list of.....	33
Delaware College.....	24
Experiment Station, organization list of.....	33
Department of Agriculture, appropriations for.....	7, 65, 68
ways in which it may aid stations.....	8, 9

F.

Florida Experiment Station, organization list of.....	34
State Agricultural and Mechanical College.....	25

G.

Georgia College of Agriculture and Mechanic Arts.....	25
Experiment Station, organization list of.....	35
Middle, Agricultural College.....	25
North, Agricultural College.....	25
South, Agricultural College.....	25
Southwest, Agricultural College.....	25
Gilbert, Dr. J. H.....	59

H.

Harvard College.....	73
Hatch, William H.....	77
Horticulturists, co-operative work by.....	15

I.

Illinois, College of Agriculture of the University of.....	25
Experiment Station, organization list of.....	35
Indiana Experiment Station, organization list of.....	36
School of Agriculture, Horticulture, and Veterinary Science of Purdue University.....	25
Introduction by Secretary of Agriculture.....	5-10
Investigation, work of, by Experiment Stations.....	17-19
Iowa Experiment Station, organization list of.....	36
State College of Agriculture and Mechanic Arts.....	25

J.

Johnson, Samuel W.....	73, 74
Judd, Orange.....	61, 75

K.

	Page.
Kansas Experiment Station, organization list of.....	37
State Agricultural College.....	25
Kentucky, Agricultural and Mechanical College of	25
Experiment Station, organization list of.....	37, 38

L.

Lawes, Sir John Bennett.....	59
Legislation regarding Experiment Stations	58-68
Library of Office of Experiment Stations.....	14
station publications	14
Louisiana Experiment Stations, organization lists of	38
State University and Agricultural and Mechanical College.....	25

M.

Maine Experiment Station, organization list of.....	39
State College of Agriculture and the Mechanic Arts.....	25
Maryland Agricultural College.....	25
Experiment Station, organization list of	39, 40
Massachusetts Agricultural College.....	25
Bussey Institution of Harvard University.....	26
Experiment Stations, organization lists of	40, 41
Society for Promoting Agriculture	74
work of State Experiment Station.....	62
Michigan Agricultural College.....	26
Experiment Station, organization list of	42
Minnesota, College of Agriculture of University of	26
Experiment Station, organization list of	42, 43
School of Agriculture of University of	26
Mississippi, Agricultural and Mechanical College of	26
Alcorn Agricultural and Mechanical College	26
Experiment Station, organization list of.....	43, 44
Missouri, Agricultural and Mechanical College of University of	26
Experiment Station, organization list of.....	44
Monographs contemplated by Office of Experiment Stations.....	16

N.

Nebraska Experiment Station, organization list of.....	45
Industrial College of University of	26
Nevada, Experiment Station, organization list of	45, 46
School of Agriculture of State University	26
New Hampshire College of Agriculture and the Mechanic Arts	26
Experiment Station, organization list of.....	46
New Jersey Experiment Stations, organization lists of	46, 47
Rutgers Scientific School, of Rutgers College.....	26
work of State Experiment Station	62
New York, College of Agriculture of Cornell University.....	26
Experiment Stations, organization lists of.....	43, 49
North Carolina, College of Agriculture and the Mechanic Arts of University of.....	26
Experiment Station, organization list of	49
Norton, John P.....	73

O.

Office of Experiment Stations, date of establishment of	14, 77
functions of	13, 14
organization and first work of	7, 8, 13, 19
publications contemplated by	16, 17
work accomplished by	14, 15
Ohio Experiment Station, organization list of	50
work of	63
State University.....	27
Oregon Experiment Station, organization list of	50
State Agricultural College	27

P.

	Page.
Paris Exposition of 1889, report on agricultural science and education for	15
Pennsylvania Experiment Station, organization list of	51
State College	27
experimental work by	63
Post-Office Department regulations for free transmission of station bulletins and reports	72

R.

Revenues of Agricultural Experiment Stations in the United States	22, 23
Rhode Island, Agricultural and Scientific Department of Brown University	27
Experiment Station, organization list of	52
State Agricultural School	27
Rutgers College	76

S.

Schools, agricultural, list of	24-27
Soil, exhaustion of, in relation to decay of national vigor	6, 7
South Carolina, Claflin University, College of Agriculture and Mechanics' Institute	27
College of Agriculture and Mechanic Arts of University of	27
Experiment Station, organization list of	52, 53
Storer, F. H.	74
Substations	20, 21

T.

Tennessee Experiment Station, organization list of	53, 54
work of	63
State Agricultural and Mechanical College of University of	27
Texas, Agricultural and Mechanical College of	27
Experiment Station, organization list of	54, 55
Transmittal, letter of	11
Treasury Department, rulings of, on act of Congress establishing experiment stations	69-71
True, A. C., account of experiment station movement in the United States by	73-78

V.

Vermont Experiment Station, organization list of	55
University of, and State Agricultural College	27
Virginia Agricultural and Mechanical College	27
Experiment Station, organization list of	56
Hampton Normal and Agricultural Institute	27

W.

Wesleyan University	75
West Virginia Experiment Station, organization list of	56, 57
University	27
Wisconsin, Department of Agriculture of University of	27
Experiment Station, organization list of	57
work of	64

Y.

Yale College	73
--------------------	----

